

COMPUTER

Processor blitz strikes high end

Burroughs adds CPUs Honeywell launches top-of-the-line DPS 90

A 15 rivals IBM 3090; V series debuts

By Tom Ichniowski
CIS Staff

NEW YORK — Continuing the year-long rehabilitation of its mid-range and high-end systems, Burroughs Corp. last week matched the performance of IBM's high-end 3090 mainframes with the eight-model A 15 line. The company also took the first steps toward replacing its B3000, B3000 and B4000 series processors with the V series machines.

The following are highlights of last week's announcements:

■ The A 15, which reportedly performs an average of 3.6 times faster than the company's previous high-end processor, the B7900. The A 15 line includes one-, two-, three- or four-CPU configurations and occupies roughly 46% less floor space than the B7900.

■ The V 340 and V 360, which are successors to the B4000 and B4000 midrange processors, and occupies roughly 46% less floor space than the B7900.

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By Tom Ichniowski
CIS Staff

PHOENIX — Displaying the first fruits of its year-old relationship with Japan-based hardware manufacturer NEC Corp., Honeywell, Inc. last week unveiled its most powerful mainframes to date. The DPS 90 is a five-model processor line said to offer performance comparable to IBM's recently announced Sierra CPUs.

In addition to the mainframe line, Honeywell announced the following:

■ A mass storage subsystem that is based on IBM's 3380 disk drives, three magnetic tape processors and an enhanced version of its minicomputer bolt printer for the DPS 90 line.

■ Enhancements to the firm's DPS 6 line of minicomputers, including the 32-bit DPS 6/36 and the 16-bit DPS 6/42. Honeywell also unveiled two fixed-disk mass storage devices with capacities of 132M and 412M bytes for the DPS 6 line.

■ Communications software for the DPS 6 that allows the sys-

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Interviewed
A column
on end-user
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One potato,
two potatoes
Interview
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TOP OF THE NEWS

Run for the money. When fear of mass withdrawals forced 31 Ohio banks to close, AT&T was brought down statewide for the first time. Page 6.

■ **Collins and Lotus targeted the information center** with a system that links Collins data base products to Lotus' 1-2-3 and Symphony. Page 14.

■ **Having reservations.** The Justice Department may seek divestiture of airline reservation systems if they are found monopolistic. Page 18.

■ **Despite a plunge in profits,** Wang said it will still unveil products in the coming months. Page 27.

AT&T unveils desktop Unix PC

By Eric Bender
CIS Staff

NEW YORK — AT&T Information Systems celebrated its first birthday in the commercial computer arena last week by introducing a desktop Unix-based microcomputer, enhancements to the AT&T PC 6300 personal computer, a twisted-pair local-area network and a touch-screen voice/data terminal.

The announcements underline AT&T's intentions to emphasize connectivity between various computer and communications workstations and to provide customers with upgrade paths, according to James Edwards, AT&T Information Systems Computer Systems president. "There is very little 'value-added' that even AT&T can bring

to the marketplace if we do it by our best" rather than by providing networking with a range of communications options, Edwards said.

The following are among the details:

■ AT&T called its Unix-matched Unix PC a "next-generation" desktop system that integrates computing with voice/data communications. The machine is built around a 10-MHz Motorola, Inc. 68010 microprocessor with virtual memory capabilities and offers multitasking, multibus operation under AT&T Unix System V. A software shell provides a bit-mapped windowing environment, complete with mouse and icons, and isolates inexperienced users from Unix, AT&T said.

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IBM unwraps fault-tolerant processor line

By James Connolly
CIS Staff

RYE BROOK, N.Y. — IBM made official its plunge into the fault-tolerant market last week with the announcement of a system based on Stratus Computer, Inc. Stratus/32 superminicomputers.

IBM is introducing its System/36 just a month after the announcement of an OEM agreement providing IBM powerexclusive re-marketing rights to various Stratus products. According to some industry watchers, IBM's move could provide a boost for smaller companies fighting to enter the fault-tolerant transaction processing field while jockeying the industry leader, Tandem Computers, Inc.

The three models of the System/36 will

be targeted to industries requiring uninterrupted on-line service, including banking, retailing and manufacturing, according to IBM. The System/36 reportedly utilizes the Stratus/32 processor and Stratus VOS operating system, under the name System/36 Operating System. The balance of the system, such as disk and tape drives, controllers and channels, is composed of IBM peripherals.

Details such as performance figures for the System/36 were unavailable. However, a Stratus spokesman said the three versions of his Stratus/36 run at 0.7, 2 and 3 million instructions per second.

The entry level IBM system is the System/36 Model 4575-30, consisting of two processor modules, duplex 4M-byte sets of

memory, a 20-slot chassis, a 1600/2200 bit/in. tape drive, two 142M-byte disk drives, an IBM Personal Computer as a console, and eight communications lines, supporting asynchronous and synchronous communications. A typical configuration costs \$167,670.

The mid-range System/36 Model 4575-40 also has duplex 4M-byte processor modules, a 40-slot chassis, 32 communications lines and four 448M-byte disk drives. A typical system costs \$437,840.

The high-end System/36 Model 4575-60 is a duplex 34M-byte system with dual disk, tape and communications controllers, six 448M-byte disk drives, two tape drives and 31 lines. It costs \$672,000.

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NEWSPAPER

NEWS

IBM predicts profits will decline

Company blames value of dollar overseas for first dip since 1981

By Peter Brattish
CWI Staff

ARMONK, N.Y. — IBM recently announced that it expects the first quarter of 1985 to produce the company's first drop in profits since the last quarter of 1981. Earlier this year [CW, Feb. 18], IBM had said it expected flat profits for the quarter ended in March.

IBM said further that it is "comfortable" with securities analysts' estimates, projecting first-quarter earnings per share in a range from \$1.50 to \$1.90 per share. That range would produce profits ranging from \$917 million at the low end to \$1.19 billion at the high end, compared with \$1.2 billion reported in the first quarter of 1984.

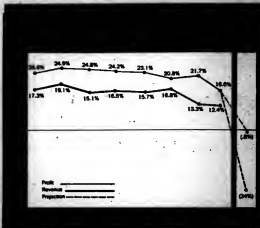
In a statement, the company said that despite the short-term decline, its customers have responded to recent product announcements by going ahead with their installation plans.

Growth for year

"The resulting increase in product shipment rates will make a substantial contribution to the second half of 1985, leading to solid growth for the year as a whole," according to the company.

As it did in February, IBM again attributed the lower earnings to the strength of the U.S. dollar in international currency markets and a reduction by customers to order large systems prior to the announcement of the 3090 series mainframes.

Despite a flood of downward revisions by minicomputer companies, IBM indicated it has not suffered any setbacks in orders for medium-scale



Figures for the first quarter of 1985 represent a projected decline based on Wolf Street analysts' estimates, a range with which IBM said it is "comfortable." IBM reported that despite the short-term decline, customers have responded to recent product announcements by going ahead with their installation plans.

processing equipment. "Orders have been quite good across the product line, and we see no discernible trend," an IBM spokeswoman reported.

Weak technology stocks

Michael J. Geras, an analyst with K. F. Sutton Group, Inc., said he lowered his first-quarter earnings-per-share estimate from \$1.97 to \$1.50 but only lowered his estimate of fiscal year 1985 earnings per share by 5 cents to \$11.75; in fiscal year 1984, earnings per share were \$10.77.

At the New York Stock Exchange, on the first day of trading following IBM's announcement of the 3090 se-

ries mainframes, the company's stock dropped to \$3.25, and analysts said the weakness in technology stocks was causing investors to abandon the market.

Because IBM has reduced its income from rental equipment, Geras said, the company needs to boost shipments by 25% to increase profits by 15%.

That won't happen until the second half," according to Geras, when IBM will ship its double-density 3380 storage systems and will resume shipments of 3090 series mainframes as well as the initial shipments of the 3090 Model 200 mainframes.

Wohl to pen CW column

Feature to target end-user concerns

Any D. Wohl joins Computerworld this week as a regular columnist.

In her bimonthly "Wohl Street Intelligence," this insightful — and sometimes outspoken — industry watcher will discuss the issues and technologies that make end-user computing a major area of concern for today's management information systems executive.

In late 1984, the noted speaker, writer and commentator on every aspect of computers in the front of-

fice founded Wohl Associates, a consulting company headquartered in Bala-Cynwyd, Pa., that specializes in office automation and end-user computing.

Prior to that, she spent five years as president of Advanced Office Concepts Corp., an office automation firm in Bala-Cynwyd. Wohl's experience also includes a five-year stint as an executive editor and consultant with Datapro Research Corp. in Delran, N.J.

Wohl received a bachelor's degree in economics from La Salle College in Philadelphia and a master's degree in the same area of concentration from Temple University, also located in Philadelphia.

CORRECTIONS

IBM announced the resignation of Philip D. Estridge, formerly president of the Entry Systems Division, on March 12, as was reported [CW, March 18].

GTE Data Services, Inc. [CW, March 18] is a subsidiary of GTE Corp., not of GTE Telecommunications Corp. as was previously reported.

NEWS SUMMARY

In addition to announcing a line of mainframes, Honeywell offered enhancements of its DPS 8 line of minicomputers/5

The closing of 71 Ohio savings and loan institutions had a minimal impact on regional data centers serving the banks, but one manager said the required shutdown of the banks' ATMs set a precedent/8

Private-line users may have a difficult time unraveling AT&T's new rate structure/11

Compaq announced a personal computer/communications workstation/12

Cullinet Software and Lotus have announced the Information Center Management System/14

The U.S. Department of Justice is monitoring a new form of bias in computerized airline reservation systems/15

A group of optometrists has come up with a new way to avoid eye strain from VDT-related work/17

A bill before the Florida legislature would allow residents to tap into state electronic records/19

An Arizona county government has voted to end its three-year relationship with an independent DP services contractor/22

A software package may lead Data Control, Pa., investigators to a man who is believed to have raped 40 women/24

On-line commercial finance software has yielded greater efficiency for the subsidiary of a Rhode Island bank/24

End-user terminal testing helped determine an insurance firm's DP department a purchasing choice/26

With the help of a manufacturing planning system, the world's largest boot-making firm is striving toward improved operations and lower costs/28

A nationwide chain of seafood restaurants is using mainframe computer-aided design software to blueprint its shops/30

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SUSPENSE

**How did IBM's
rookie sort (Rel 7.0)
do in its first
meeting with
"Lefty" SyncSort?
Read all about it!**

or Call (201) 568-9700.

**Get the inside
scouting report.**

It is one of those historic moments in the Annals of Sort! The very first appearance in competition of IBM's new DFSORT, Release 7, in the tough-as-nails MVS/XA League. Will the kid be able to live up to his advance press notices?

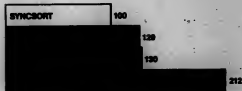
Confidently DFSORT7 strides to the plate... knocks the dirt out of his spikes... hitches up his britches... raises his sort assists.

Then, as sorting fans everywhere gasp in amazement, he lifts his arm lazily and points toward the centerfield flagpole, thousands of bytes away. The kid is going to try to emulate Babe's mighty homerun shot!

Moments later, SyncSort winds up... a curving white blur is seen... and... and...

There is no joy in Armonk! DFSORT7 struck out every time it came to bat against the latest release of SyncSort (Release 2.5E) in a recent series of MVS benchmark tests. (In sorting, as in most other forms of human endeavor, it's a long way from baby to Babe.)

The bar charts below tell the story more eloquently than we can:



DFSORT, Release 7.0

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NEWS

FRUITS from page 1

time to expedite with an IBM System Network Architecture survivor.

Based on NEC's S-1000 CPU, the DPS 90 line consists of one-, two-, three- and four-processor configurations and a redundant dual-processor model.

Honeywell said the uniprocessor DPS 90/91 offers from 30% to 70% more performance than the uniprocessor version of the older DPS 86/91. That means the DPS 90/91 offers internal performance of roughly 10 to 12 million instructions per second (Mips). The DPS 90/98 and DPS 90/92 offer 1.8 times the performance of the DPS 86/91, and the DPS 90/96 offers 2.8 times the performance of the Model 90/91. The four-processor DPS 90/94 is said to offer 3.4 times the internal performance of the DPS 86/91, or roughly 34 to 41 Mips.

The basic DPS 90 configuration consists of modular components including a CPU, a system control unit, a main memory unit, an I/O processor, a power supply unit, a system console and an interface adapter unit that allows users to connect peripherals that conform to the Federal Information Processing Standards guidelines.

The DPS 90 was designed to use Honeywell's Goss 8 operating system, and software designed to operate under Goss 8 on the older DPS 8 and DPS 88 mainframes will operate without change on the DPS 90 line. Honeywell said the DPS 90 systems have integrated array process-

ing capabilities that allow the system to operate in scientific environments. To augment this capability, Honeywell said it will offer an enhanced version of Goss 8 that includes a Fortran compiler designed to take advantage of the system's array processing capabilities.

Available in late 1985, the DPS 90 reportedly will use current mode logic circuitry. The one-, two- and three-processor models are field upgradeable to the four-processor model, but users of other Honeywell systems, such as the DPS 8 and DPS 88 mainframes, cannot field-upgrade to the newly announced models.

HONEYWELL INC.

Relative Performance*	107-300	220	470	480	607	807	1,201	1,470
Memory able to handle	4M-64M	16M-64M	16M-256M	32M-128M	32M-128M	64M-256M	64M-256M	64M-256M
System Price (Approx. Price)	\$20,000 (\$ Year)	\$41,300 (\$ Year)	\$141,000 (\$ Year)	\$183,721 (\$ Year)	\$205,000 (\$ Year)	\$300,000 (\$ Year)	\$380,000 (\$ Year)	\$480,000 (\$ Year)
Channels	128	10-40	10-40	16-48	16-48	16-48	16-48	16-48
Performance/Byte/Sec								
Per Instruction	No	No	No	No	No	No	No	No

1. On order list based on vendor-supplied information. Relative performance ratings are based on an IBM S/370/193-C executing off. These numbers are designed to aid the purchaser in perspective with other systems, they do not constitute a buyer's guide. All systems do not offer the same differentiating features, instruction sets and architectures and, therefore, cannot be directly compared. In addition, actual system performance may vary with the application, peripherals and software.
2. On estimate.
3. For the processor only. Each of the models in the DPS 90 line can accommodate multiple processors.

Disk, tape, printer products round out Honeywell debuts

PHOENIX — To support its newly announced DPS 90 line of mainframes, Honeywell, Inc. unveiled a mass storage subsystem, a line of magnetic tape processors and an enhanced version of its mainframe-oriented belt printer.

The T97000 series mass storage subsystem is based on IBM's S390 disk drives, sold to Honeywell via an OEM agreement reached with IBM in late 1984. The subsystem consists of a mass storage processor and one or more mass storage units. Each mass storage unit has two fixed-head disk assemblies and provides a total storage capacity of 1.860 bytes. The units have an average seek time of 16 msec and a peak data transfer rate of 3M bytes/sec, the vendor said.

Honeywell said it is also offering the disk subsystem to users of the DPS 88 processor line.

A mass storage subsystem consisting of a dual-access controller, two head-of-string disk drives and two slave drives costs \$380,000 and will be available in 1985.

Also announced were the MT76001, MT76022 and MT76003 magnetic tape processors. The units connect to high-speed data channels via the bidirectional I/O data transfer paths under control of Honeywell's Goss 8, Multics or CP-6 operating systems. The tape processors control the transfer of data to and from up to eight tape drives.

Single- and dual-channel controllers support a variety of peripherals. An optional dual simultaneous channel feature can be used to increase data transfer efficiency and support up to 16 tape drives, the vendor said.

The MT76021 is a freestanding primary channel

unit that operates at 1.5K to 6.25K bits/sec. MTP processors were designed for installation into the MT76021. A tape subsystem consisting of a controller and eight tape drives costs \$196,000.

Honeywell also enhanced its mainframe belt printers to support a parallel interface for use with the DPS 90. The units previously were available with a serial interface. The PBU0000 and PBU1000 printers operate at 900 and 1,200 lines/min and cost \$36,000 and \$38,000, respectively. A \$35,000 controller and channel attachment are also required. Current users of the belt printers with a serial interface can upgrade the units to accommodate a parallel interface for \$3,000.

Honeywell's Large Computer Products Division can be reached through Box 5000, 13490 N. Black Canyon Highway, Phoenix, Ariz. 85066.

Second-class postage paid at Birmingham, Mass., and additional mailing offices.

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NEWS

Honeywell adds pair of minis, storage units to DPS 6 line

WALTHAM, Mass. — In addition to crumpling a line of high-end mainframes, Honeywell Inc. enhanced its Digital Data 6 line with two new minis.

Announced were the following:

- The DPS 6/26, an entry-level 32-bit microcomputer said to offer two-thirds the performance of the top-of-the-line DPS 6/46. The DPS 6/26 is geared for use in heavy transaction processing and distributed processing environments and is field-upgradable to the larger DPS 6/46. It offers a main memory capacity of 4M bytes and a total disk capacity of 30 bytes. The unit costs \$67,000 and reportedly will be available in June.

- The 16-bit DPS 6/42, a 32-user system designed for use in warehousing, distribution and manufacturing environments or as a node processor in Honeywell or IBM networks. The system can support up to 2M bytes of main memory and 30 bytes of mass storage. It is priced at \$19,300 and

will be available in June.

- Two mass storage devices for currently authorized DPS 6 models. The mass storage devices offer 1024K or 4128K bytes of formatted storage, respectively, and employ Winchester-type fixed media disk drives with multiple sector read/write capabilities, automatic track and cylinder switching and the ability to perform simultaneous seek operations on up to three other units during data transfer to another unit. Up to eight of the newly announced disk drives — in either capacity — can be linked to the DPS 6/42 or DPS 6/46 systems. The 1024K-byte disk unit costs \$14,500, and the 4128K-byte unit costs \$31,000. Both units will be

available in June, the vendor said.

- A 9-track, dual-density tape subsystem was announced for the DPS 6 that is said to offer 6.25K bps/in. group-coded and 1.6K bps/in. phase-coded recording capabilities. The unit contains a 128K-byte buffer that allows data to be transferred to the CPU at channel speeds. The unit and accompanying controller cost \$23,500 and will be available in June.

- A tabletop streaming tape drive was also announced. The 14-in. tape unit has a 64M-byte formatted capacity. It was designed to back up small disk files and can be used with any appropriately configured DPS 6 or Honeywell Level 6 Multiplex system.

The tape unit can be panel-mounted in Honeywell's Microsystem 6/10 microcomputer or the DPS 6/22 microcomputer. It costs \$4,600 and will be available in June.

- Enhancements to the Microsystem 6/10 microcomputer include a doubling of the unit's main memory capacity from 512K bytes to 1M bytes, an increase in the integral mass storage from 20K to 50K bytes and a color graphics display and graphics printer. The enhanced version is available immediately and costs \$4,995.

Honeywell announced the products through its Small Systems Group, 30 Smith St., Waltham, Mass. 02154.

Trilogy set to buy Elxsi

CUPERTINO, Calif. — Trilogy Ltd. said last week it has reached an agreement in principle to acquire Elxsi, a privately held manufacturer of large multiprocessor systems, and intends to merge the operations of the two companies.

The merger, if approved by shareholders, will provide Trilogy with its first commercial product. Founded in 1980 by Gene Amdahl, Trilogy raised more than \$270 million in financing from various sources in an attempt to develop wafer-scale integrated semiconductors and to build a high-performance IBM-compatible computer based on the semiconductors.

Both projects were scrapped last year. Amdahl, who founded Amdahl Corp. following a successful career with IBM, said recently that the complexity and scope of the projects were too vast to be completed within the designated time frame (CW, March 25).

Under the terms of the agreement with Elxsi, Trilogy will issue or reserve for issuance to Elxsi shareholders for 100 million new shares in Trilogy, which would give Elxsi shareholders slightly less than 60% of Trilogy and significantly dilute the holdings of Trilogy's earlier industry backers. Digital Equipment Corp., Sperry Corp. and France's Bull all made significant investments in the company, but both DEC and Sperry have since made accounting provisions to write down large portions of their investments.

Elxsi, based in San Jose, Calif., last year began marketing systems targeted at the engineering and scientific markets. It has an installed base of more than 40 machines and in 1984 generated sales of \$18 million while posting a loss of \$7 million.

Trilogy's subsidiary, Trilogy Systems Corp., advanced \$5 million to Elxsi for working capital, and Elxsi granted Trilogy an option to acquire 25% of its stock prior to the merger under certain unspecified circumstances.



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RECOVERY

NEWS

Ohio bank crisis prompts first-time shutdown of ATMs

By John Bressman
and Glenn Miller
CIVIC PRESS

CINCINNATI — When 71 savings and loan institutions in Ohio closed March 15, the traffic went out of Tellurite; the green went out of the Green Machine; and customers probably called Jesus something other than her given name.

These 34-hour automatic teller machine networks with the remaining members had to stop conducting transactions for customers of the state-insured thrift institutions that were ordered closed after the March 9 failure of Home State Savings Bank of Cincinnati.

The DP manager overseeing Jesus said the shutdown was a first for his network. However, DP managers serving many of the closed banks reported the shutdown had a minimal impact on their work.

Jesus Rudolph, vice-president of communications at Cincinnati's Fifth Third Bank, which operates the Jesus network of 280 ATMs, said the technique used to shut off the eight ATMs in the network affected by the closings had never before been used and would only otherwise be used in disaster recovery. During normal maintenance the machines are server turned off, he said. An all-IBM shop, the Fifth Third Bank operates multiple 3003 mainframes running MVS/SP 1.3 and more than 100 3380 disk drive spindles. The bank functions as a switch for five ATM networks in Ohio, routing ATM transaction messages to their destinations.

"We keep track of settlements between banks — who owes whom money. The client banks authorize or originate the transactions," said George Landry, senior vice-president of operations and DP

at Fifth Third. The bank has 11 million accounts in its data base, but the five closed savings and loans served by Fifth Third were a small percentage of the 66 banks served by the Jesus network.

To turn the ATMs off, a simple software change was made. "We turn a bit in a table entry that says the machines are not available," Rudolph said. When customers tried to use a 24-hour access card, they received the appropriate message.

Gov. Richard Celeste ordered the 71 savings and loans closed on the evening of Thursday, March 14. When Landry and Rudolph came to work the next day, they called the governor's office to ask about shutting down the necessary ATMs. At about 11 a.m., the governor's attorney called back with instructions that the ATMs be closed. "We wanted to make sure we did the right thing," Landry said. "We did everything we could to protect our customers' interests."

The delay in getting authorization to close the ATMs gave those bank customers with access cards a chance to retrieve some cash from their accounts that Friday morning, Landry acknowledged.

Many of the closed Ohio savings and loans are small- to medium-size financial operations that depend on regional data centers for time-shared DP service. Two such data centers in Ohio reported that the closings had a minimal impact on their overall DP operations.

The thrift crisis meant a 15% to 20% reduction in the number of transactions, which averages 100,000 daily, serviced at the NCR Corp. Data Service Center in Dayton, Ohio, according to David Bogner, production manager at the center. Bogner based the estimate on transactions from 16 client savings and loans that had to close. "It meant that

I didn't have to print as many reports, but the machines were still busy," Bogner said of the closings.

The all-NCR center operates three mainframe-based systems, each with an NCR Crimmon 6575 mainframe with 2M bytes of main memory and the company's VEX operating system. Two systems are serviced by 10 MCR 458 disk drives with a 300M-byte capacity, and one is served by 12 565s. The transaction slowdown had no impact on his staff, and no special preparations were required to service transactions once the client institutions began reopening, Bogner said.

One manager at a Cincinnati-based data center said there may be a secondary DP impact as larger, federally insured savings and loans seek to acquire some of the 71 closed institutions. "Our members are already buying up the institutions that don't want to go back in business under the same name," said Don Cox, manager of data and communications at Savings & Loan Data Corp. (SLDC), which processes transactions for 500 savings and loans institutions in 11 states. "We'll have to convert those accounts. Of the 2,000 accounts that we service (from nine closed savings and loans), I wonder how many will stay in existence."

Cox said that the closings affected less than 1% of SLDC's 250,000 daily transactions. SLDC services its 44-million-account database with two Burroughs Corp. 4600 mainframes for on-line processing and a third 4600 CPU for systems development and programming.

"There was really more-and-pop-type operations, so there was not much impact on our processing," Cox said. "We simply stopped handling their transactions. Our problems here were minute compared to the people trying to get their money out."

IBM from page 1

IBM said the fault-tolerant system, in which a duplicated component takes over for a component that fails, can communicate with other IBM systems, including the IBM 370 environment. Like the Stratus/32, the System/36 reportedly can be arranged in a string of 32 modules.

IBM reported that the System/36 can operate as an independent computer or communicate with other sys-

tems through SNA networks and X.25 packet switching networks as well as via hierarchical or asynchronous protocols.

The System/36 will be available "on a limited basis" in late 1985, according to IBM. The company said marketing support will be provided by a new System/36 office in IBM's National Accounts and National Marketing divisions.

Oertl Serlin, head of ITOM International in Los Altos, Calif., and an ob-

server of the fault-tolerant market, speculated that while customers may initially use Stratus application software on the System/36, IBM's move into the field will fuel application production by independent software developers.

He noted that some software that is likely to be used by early customers includes Stratus' Interface for IBM's Systems Network Architecture, USF Unix-compatible interface, and Stratus' transaction processing

and office systems.

However, he said that the "limited" availability caveat could mean that IBM plans to introduce supplemental products, such as its own interfaces with other IBM systems, in the coming months.

IBM's approach

Serlin said the IBM announcement could have the effect of placing the computer industry giant's stamp of approval on a fault-tolerant market where only Stratus and Tandem have delivered significant numbers of systems. Stratus' installed base of 300 processors runs a distant second to Tandem's more than 7,000 processors.

"The potential for the fault-tolerant market is large already. The principal reason the systems aren't selling is the lack of compatibility with existing equipment and the lack of credibility of some of the companies. IBM's entry could have a blessing effect," noted Serlin.

But he said the entry could also hurt Tandem as IBM gives more credibility to Stratus. "A key influence will be negative in relation to Tandem. Customers who may have liked Stratus' products in the past often decided to go to Tandem because Stratus is new and inexperienced," observed Serlin.

He added that Stratus' OEM agreement with IBM doesn't mean that Stratus will abandon its end-user sales avenues. "They don't want to be captive to IBM," said Serlin, noting that other manufacturers have suffered when they relied heavily on IBM and then watched IBM abandon their product or introduce its own products in competition with the OEM's equipment.

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NEWS

Burroughs unveils replacements to B4000 series CPUs

By Susan Halstead
Ch. Staff

DETROIT — Burroughs Corp. last week launched a line of processors it claims will eventually replace its B5000, B5600 and B4000 series. The firm announced two models of the V series, the V 340 and V 380, said to be direct replacements to the older B4000 and B4005 processors, respectively.

The basic difference between the V 340 and V 380 is their I/O capability. The V 340 has one I/O subsystem, and the V 380 has two I/O subsystems, a company spokesman said. Scheduled for delivery beginning in the fourth quarter of 1982, the newly announced machines feature a different instruction set and operating system than the B4000 series machines they replace. The instruction set, said to be 35% larger than the one used on the B4000, reportedly improves the V series processors' ability to function in heavy batch and high-volume transaction processing environments. Burroughs contended that 40% to 60% of its B4000 series customers are from

the financial community and are heavy batch and transaction processing users.

The newly announced operating system, MCP 1.0, is a superset of the operating system used on the B4000 line. It adds the ability to support multi-programming environments, dynamically allocate memory and automatically perform system logging and reporting functions. The operating system can also support shared system configurations, the vendor said. Other capabilities are as follows:

■ An on-line, interactive debugging facility at both the program and MCP levels.

■ The ability to tailor I/O operations to suit specific devices.

■ Multithreading and reentry of operating system functions.

MCP 1.0 is said to be code compatible with its predecessor so that no changes need to be made to a user's software.

The V 340 and V 380 models include 256K-bit memory chips and are configured with 10M bytes of memory, expandable to 30M bytes in 5M-byte increments. The previous maximum main memory

on the B4000 series was 5M bytes, the vendor said. When upgrading memory capacity, memory interleaving is converted from two to four paths, providing additional system throughput and capability, the vendor said.

The character-oriented CPUs use decimal arithmetic and are said to be suited for executing business programming languages such as Cobol, RPL and Line. The V 340 and V 380 systems consist of a pipeline processor that operates individually in a pipeline fashion. This allows steps to be overlapped, the vendor said. These steps include instruction prefetch, program and address calculations, data fetch and manipulation, instruction executions and independent I/O initiators and transfer.

Multiterminal environments can be configured on the V 380s with the use of the Burroughs B974 and CP 3400 front-end processors.

The V 340 is priced at \$500,400, and the V 380 costs \$702,800. More information can be obtained from Burroughs, One Burroughs Place, Detroit, Mich. 48232.

CPU Item page 1

B5000 and B4000 series processors.

With first deliveries scheduled for the third quarter of this year until the second quarter of 1983, the A 15 was designed to supersede the B7900 processor line. Burroughs still plans to manufacture the B7900, and the units will remain the logical growth path for users of the mid-range A 9 processor line. Heide L. Carwell, Burroughs' corporate vice-president and president of its System Products Group, said the A 15 was not intended to replace the B7900 line, but he admitted that the performance of the low-end A 15 models overlaps that of the high-end B7900 line. Paul G. Stern, Burroughs' corporate president, said the A 15 line offers a 10% to 30% better price/performance ratio than the B7900 line.

The A-15 models are object code compatible with Burroughs' B6000, B6005, B7900 and A series processors. The A 15 architecture reportedly allows users to run applications

software programs from earlier Burroughs systems without having to make a software conversion.

Based on emitter-coupled logic air-cooled gate arrays, the A 15 reportedly requires 55% less power and air-conditioning than a similarly configured B7900.

Eight models of the A 15 line were announced and include the uni-processor Model F, the dual-processor Models H, I and J; the tri-processor Models K and L; and the quad-processor Models M and N.

The A 15 models are field upgradeable within the line, but older Burroughs

BURROUGHS CORP.

Model	279	474	1,185	735	1,375	1,987	3,557
Storage size in bytes (Minimum-Maximum)	128-65536	128-65536	128-65536	240-4096	240-65536	240-132736	240-132736
Access Time (Access Time)	877.700 (3 Years)	814.170 (3 Years)	818.170 (3 Years)	814.170 (3 Years)	818.170 (3 Years)	828.170 (3 Years)	828.170 (3 Years)
Throughput (Throughput)	27-259	27-259	27-259	10 to 32	30-64	30-64	30-64
Bus Architecture?	No	No	No	No	No	No	No

1. CPU performance based on vendor-reported information. Relative performance ratings are based on an IBM 270-120-3 running 60% of the time. These numbers are designed to aid the purchaser in comparing with other systems. They do not constitute a test of the system. They are not intended to be used for any other purpose.
2. For the processor, current, peak supply and peak performance.
3. For the processor, current, peak supply and peak performance.

4. Burroughs processors use data bus processors in place of conventional I/O channels.

Ch. Staff

systems, such as the B7900 line, are not field upgradeable to the A 15 line, Burroughs said.

The A 15 Model F supports from 34M to 40M bytes of main memory, whereas the dual-processor configurations support 24M to 96M bytes of main memory. The tri-processor and quad-processor configurations support from 34M to 102M bytes of main memory, the company said.

The uni-processor A 15 Model F is said to offer roughly 2.6 times the performance of a comparable uni-processor configuration of the B7900. Carwell said actual performance of the system ranges from roughly 2.2 times that of the B7900 in Fortran-based scientific applications to 3.5 times that of the B7900 in I/O-intensive data base applications. This difference, Carwell explained, results from architectural improvements in the A 15 processing capabilities of the A 15 processors. Carwell said that in a CPU-to-CPU comparison, the A 15 offers roughly twice the performance of the B7900.

The dual-processor versions of the A 15 offer 1.9 times the performance of the Model F, and the tri-processor configurations offer roughly 2.5 times the performance of the Model F. The quad-processor models offer 3.5 times the performance of the Model F, Carwell said.

The Model F, with 34M bytes of main memory, and one I/O subsystem

capable of supporting up to 32 data link processors and up to 256 communications lines, costs \$2.0 million. It reportedly will be available in the third quarter of this year.

The A 15 Model H, with 24M bytes of main memory and one I/O processor, costs \$4.2 million. The Model I, which offers the same main memory as the Model H but with two I/O processors (offering support for up to 64 data link processors and 512 communications lines), costs \$4.5 million. The Model J, which offers 36M bytes of main memory, two I/O subsystems and a partitioning option, costs \$6.1 million. The dual-processor models reportedly will be available in the fourth quarter.

The Model K, with 34M bytes of main memory and two I/O subsystems, costs \$6.1 million. The Model L, with 24M bytes of main memory, two I/O subsystems and a partitioning option, costs \$6.8 million. The tri-processor models will be available in the first quarter of 1983, the vendor said.

The quad-processor Model M, with 34M bytes of main memory and two I/O subsystems, costs \$7.6 million. The Model N, with 36M bytes of main memory, two I/O subsystems and the partitioning option, costs \$8.4 million. The quad-processor models will be available in the second quarter of 1983, the vendor said.

Burroughs is located at One Burroughs Place, Detroit, Mich. 48232.

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NEWS

Honeywell, Burroughs aim to secure mainframe base

By Tom Ichniowski
CI Staff

Last week's high-end mainframe announcements from Honeywell, Inc. and Burroughs Corp. are attempts to keep IBM from plotting their most treasured mainframe customers, industry analysts observed.

The Honeywell DPS 90 and Burroughs A 15 lines are part of a traditional game played by members of the so-called Dutch mainframe vendors, noted Harry Edelson, president of Edelson Technology Partners, a consulting firm based in Saddle Brook, N.J.

Edelson explained that vendors competing with IBM must quickly demonstrate that they can match the

performance of IBM's latest high-end processors or run the risk of losing their high-end mainframe customers to IBM. He said it would have been more surprising if Honeywell and Burroughs had failed to announce products that compete with IBM's 2080 line.

According to Edelson, the user base of the Dutch companies has slowly eroded during the past 10 years, with most of those users switching to IBM or compatible systems. Edelson said he expected that the latest round of processors from Burroughs and Honeywell would curb the loss of customers to IBM but probably would not stop the trend.

Frank Goss, an analyst with the

Boston-based Yankee Group consulting firm, said that keeping up with IBM on the hardware front is only one part of the equation. The Dutch companies are comparatively weak in matching IBM's impressive list of mainframe software, he said.

Still, not all different strategies

The latest announcements from Burroughs and Honeywell are strikingly similar but reflect the companies' markedly different business strategies.

Both vendors announced processor lines of one, two, three- and four-CPU configurations. Burroughs has offered several additional models with varying main memory and I/O

processing capabilities. And Honeywell added the DPS 90/90V, a standard configuration, to its line.

Both the A 15 and DPS 90 lines appear to offer additional performance to the 2080 line, but neither matches the performance claims for the 2080 system. However, both companies claim to match but not really exceed the performance of IBM's 2080. Many industry watchers have long held a commandment for successfully competing with IBM that one should never tip one's hand in anticipation of future IBM announcements. Honeywell and Burroughs appear to have obeyed that commandment.

Honeywell and Burroughs have targeted the same basic delivery window — late 1985/early 1986 — for their high-end systems. This move appears to have been geared to the general expectation that IBM's high-end 2080 Model 400 would be available much earlier than the 1987 delivery date IBM finally announced.

Although most aspects of IBM's 2080 announcement were fairly predictable, the 1987 availability of the Model 400 was a surprise. Goss noted. He speculated that Honeywell and Burroughs, like Hitachi Ltd., which had announced its version of the Model two weeks earlier (CW, March 18), accurately anticipated the performance IBM's Sierra line would offer but geared their development efforts to coincide with an expected late 1985 availability of the Model 400. Now all three firms appear to be hoping to cash in on the long wait for the Model 400, he said.

IBM doing for financial reasons

Goss noted that IBM appears to have delayed delivery of the Model 400 for purely financial purposes — namely, to sell more 2080 series processors — as opposed to technical difficulties.

A notable difference between the Burroughs and Honeywell announcements is that Burroughs has developed and will manufacture the A 15 CPUs, as well as disk drives through its Monocore Corp. subsidiary, whereas Honeywell plans to integrate Japan-based NEC Corp.'s S-1000 CPU with IBM's 2080 disk drives to form the DPS 90.

A Honeywell spokeswoman emphasized that although Honeywell has designed its system around the S-1000, the two systems are not interchangeable. The DPS 90 contains modifications that make the device compatible with Honeywell's Goss 8 system software environment. Likewise, whereas Honeywell buys disks from IBM and tape drives from Burroughs Technology Corp., the subcomponents housed in the processor are tailored to the Honeywell environment.

With the Burroughs and Honeywell announcements, three of the five Dutch companies have announced systems that compete with IBM's high-end processors (Control Data Corp. announced its Cyber 180 line before IBM unveiled the 2080). MCR Corp. and Sperry Corp. have yet to respond with products to IBM's announcement.

Goss noted that MCR, which has traditionally appealed to a lower level user, may not immediately unveil a 2080-class processor. Then, the spotlight now will be on Sperry.

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Private-line rate changes to pose challenge for users

By Bryan Whelan
CI Norridge Bureau

WASHINGTON, D.C. — During any further changes, private-line users face an uphill climb understanding and converting to AT&T Communications' revised private-line rates, slated to go into effect April 6.

The rate changes will have the greatest "adverse" impact on multi-point private-line customers, according to William Fendrow, an AT&T account manager who made his remarks in the first video teleconference held by the International Communications Association (ICA), a telecommunications managers' group. Multipoint lines are being hit so hard because the per-station installation fee for voice-grade, private-line service is scheduled to skyrocket from \$78 to \$374, Fendrow said. Other increases will be reflected in the new tariff structure, which breaks down private-line rates into interexchange and local components. In aggregate, the totals of the rate components are more than current costs for end-to-end, private-line service, Fendrow said.

The interexchange rates reflect the higher special-access rates the former Bell operating companies are charging AT&T to terminate private-line facilities. Previously, AT&T Communications' private-line tariffs

based the least-usage portion of the transaction together with the interexchange charges.

Fendrow said that the three categories of service — total, coordinated and business — will have new advantages and disadvantages.

■ Total service will not require end-to-end responsibility like the hands of AT&T Communications.

■ Coordinated service will mean the customer gets two bills — one from AT&T and one from the local exchange carrier for access. AT&T will act as an agent of the customer in procuring the local loop.

■ Business service leaves the service configurations and local-exchange access up to the customer. AT&T will not guarantee end-to-end service as it will in other categories.

Planning by telecommunications managers will become especially important since the different private-line access options will range in cost from \$45 to \$115 per month, depending on type of service and distance, Fendrow predicted.

On the other hand, Lee Selwyn, president of Economic Techniquen, Inc., sees the "unbundling of local access as providing lower cost opportunities for the customer."

Under the new tariff structure, rates for local-access facilities will be distance-sensitive like AT&T Com-

munications' traditional interexchange service. Other private-line options requested by the customer to be performed by the carrier — such as common control switching arrangements, bridging, multiplexing, customer-controlled reconfigurations and teleconferencing arrangements — will also trigger separate charges. Users will still be able to receive other private-line service features like signaling, conditioning, echo suppression and analog-to-digital conversion at additional cost.

ICA counsel Brian Meir told the video teleconference audience that ICA is encouraging the Federal Communications Commission to structure the tariffs so that local third-party

suppliers other than AT&T and the former Bell operating companies can provide communication services between customers and AT&T central offices. These suppliers would have the advantage of offering noncertified services.

AT&T will accommodate these third-party suppliers, Fendrow said, but presently cannot prevent their requests for service because, he said, AT&T Communications does not plan to accommodate CATV companies as carriers. Another impact on users is a projected increase, up to an additional 611 a month, in the current \$16 per month surcharge on private branch exchange stations serving private-line configurations, Fendrow said.

Software tax issue raised

Prompted by lawsuits, officials examine ruling

By Susan McInerney
CI Staff

OLYMPIA, Wash. — Officials for the state of Washington's Department of Revenue here are examining its 1983 ruling that exempted software licenses from state sales taxes. The examination was prompted by several suits brought against the Revenue Department by companies seeking to recoup approximately \$1 million in back taxes paid on software licenses during a four-year period. The state has agreed to grant the refunds, following an audit by the department.

According to Washington attorney Sam Serrano, the Revenue Department exempted software licenses from the sales tax in response to a request from IBM. The ruling said that although off-the-shelf software was tangible property and subject to the state's 7.9% sales tax, software employing "nonexclusive license-to-use" arrangements did not constitute retail sales and was not subject to a sales tax.

As a result of the ruling, Seattle-based National Bank filed suit against the state, seeking \$750,000 in taxes it claims to have paid on software agreements. Serrano represents Seattle-First in the case.

Boring Computer Services Co. in Redmond, Wash., and Rainier National Bank in Seattle have also filed suit against the state. The suits are subject to the state's four-year statute of limitations.

State officials have examined the

licensing arrangements at Rainier, but the bank has received no refund, according to Murray Aston, vice-president and corporate tax manager. Rainier is seeking approximately \$70,000 in back taxes paid on software licenses.

Although few companies have filed suit against the state, "The potential revenue loss is significant," Johnson said. "It's a multimillion dollar matter."

The Revenue Department ruling not only changed the software licensing agreements but also the way that software companies in the state are taxed. Currently, the state's gross-receipts tax consists of two rate structures: Retailers and wholesalers are charged approximately 0.5%, and service organizations, such as banks, are charged 1.5% gross-receipts tax. By ruling that customized software is not subject to retail sales tax, the Revenue Department classified software companies in Washington as service businesses, subjecting them to three times the tax payments.

The Revenue Department's findings on the software tax policy are expected to be released in approximately one month, according to Lee Johnson, state assistant attorney general.

Meanwhile, the tax ruling continues to hold widespread implications for Washington businesses. Serrano said. Companies that paid 7% tax on a \$100,000 annual software license could recoup approximately \$10,000 paid over a four-year period, he said. However, when he explained the implications to the Washington Bankers Association, "A lot of people just weren't interested in pursuing it," he said.



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NEWS

Compaq unit integrates micro with communications

By Eric Sander
CW Staff

NEW YORK — Compaq Telecommunications Corp. of Dallas, a subsidiary of Compaq Computer Corp. of Houston, last week rolled out a workstation that integrates personal computing and communications tasks.

The Telecompaq reportedly targets managers in medium- to large-size corporations who are not presently computer users and combines an IBM Personal Computer-compatible sliver with a host of voice/data communications functions.

The Telecompaq allows users to switch between functions by pressing a single button, the company said. With two telephone lines or future links to digital private branch exchanges (PBX), the Telecompaq handles simultaneous voice and data communications. Users can reportedly suspend a personal computing task to make or receive a call and then resume the personal computing task

where they left off.

Six models were introduced, offering a range of random-access memory (RAM) and disk storage options. Top-end models feature 640K bytes of RAM and a 10M-byte hard disk drive.

The Telecompaq is built around an Intel Corp. 8086 processor with 384K bytes of RAM for personal computing and personal productivity work and a Zilog, Inc. Z80A communications processor with 64K bytes of RAM. The dual-speed Intel processor runs at 4.77 MHz and 7.14 MHz.

Other features include an integral 9-in. green text-graphics monitor, an internal Hayes Microcomputer Products, Inc. 300 bit/sec or 1,200 bit/sec

modem, two IBM-compatible expansion slots, an RS-232C port, a parallel port, a battery-powered data/clock system, two 360K-byte diskette drives for personal computer applications, a third 360K-byte diskette drive for personal productivity use, an IBM-style keyboard enhanced with function keys and Microsoft Corp.'s MS-DOS 2.11 operating system.

For voice communications, the Telecompaq offers a separate telephone unit with speakerphone and handset and a telephone function panel next to the computer screen.

Built-in support software reportedly provides 80 user-programmable telephone functions; TTY; and ADAMA terminal emulation; an elec-

tronic phone directory with search capabilities; attachment of notes and addresses; and automating a data communications directory for automatic connection, modem setup and dialing, file transfer and capture and from disk; automatic login and logout abilities; and electronic mail.

The handoff productivity software permits users to switch between computing and communications tasks and also gives calendar, electronic notepad and calculator applications. Dedicating a third drive to these tasks permits managers to create their own portable data bases on diskette, Compaq Computer President Rod Canlon pointed out.

Compaq does not presently plan to offer an upgrade kit for its current personal computer customers.

Three versions that connect to two standard analog telephone lines are scheduled for June shipment, while three other systems that interface to six standard analog trunk lines will be delivered in August, Compaq said.

The Telecompaq is priced from about \$4,195 to \$6,395, depending on configuration, the vendor said.

Compaq announced a joint marketing and research and development agreement with Mitel, Inc. of Boca Raton, Fla., under which Mitel will remarket the Telecompaq as a peripheral to its SX-2000 digital switch under the name of Supertelnet by late summer. The two companies also will work together on a proprietary interface to the SX-2000 integrating the Supertel 4 electronic telephone with the Supertelnet.

In addition, Compaq has signed PBX interface licensing agreements with Northern Telecom, Inc. and AT&T Information Systems, according to C. Murray Francois, president of Compaq Telecommunications.

Compaq Telecommunications is headquartered at 18183 Marsh Lane, Dallas, Texas 75244.

Syracuse, DEC agree to create university net

SYRACUSE, N.Y. — Syracuse University (SU) and Digital Equipment Corp. have signed an agreement to create a computer network that will link the university's 14 schools and colleges and a number of residence halls.

The network will connect computer-aided design laboratories and computers for general-purpose processing, along with clusters of graphics computers. It will also extend to four dormitory sectors of the SU campus and will allow residents access to the systems.

As part of the agreement, SU will acquire \$16 million worth of computing and networking resources from DEC.

The purchase includes a cluster of VAX 8600s, DEC's recently announced top-of-the-line superminicomputers.

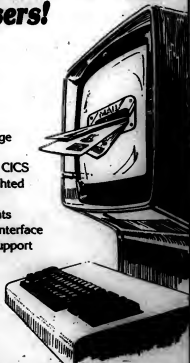
A DEC spokesman estimated that four to five years will be required to complete the network.

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Mainframe package joins Lotus tools, Cullinet software

By John Gullinet
CW Staff

BOSTON — Cullinet Software, Inc. and Lotus Development Corp. targeted the corporate information center with the introduction last week of a system that combines Cullinet's Information Database (IDB), end-user-oriented mainframe tools and host data links to Lotus' 1-2-3 and Symphony.

The Information Center Management System (ICMS) is designed for IBM mainframes under IBM's standard operating systems. The software offers end users access to host data from mainframe terminals, so-called departmental machines from manufacturers including Data General Corp., Digital Equipment Corp. and Wang Laboratories, Inc.; and micro computers running 1-2-3, Symphony, Cullinet's Goldengate integrated software and other micro packages.

A Cullinet spokesman said ICMS is based on three components. The first component was described as an IDB-like facility that provides access to mainframe data maintained in Cullinet's IDMS/R relational data base management system, IBM's Versim, DL/I, DMS and other systems. Based on Cullinet's IDB technology, the facility allows users to access data in IDMS/R and Versim files directly and provides a summarization of data maintained in other data bases.

The second component — the End User Computing Facility — includes both end-user data query and application development and report writing tools. The Automatic System Pa-

cility and the On-Line Query system contained in the component are both nonprocedural, menu-driven tools. The Automatic System Facility allows end users to develop ad hoc mainframe applications and reports from a terminal. On-Line Query enables users to query mainframe data using relational commands.

The spokesman said the third component of ICMS, known as Open Systems Architecture, provides for the integration of other processors, including departmental machines and micros. Cullinet has already announced interfaces linking its mainframe systems to DEC's All-in-One and DG's CEO office systems and Wang Office software.

In addition, Cullinet's Universal Link and Symphony Link packages will tie Goldengate, 1-2-3 and Symphony into ICMS. Universal Link is designed to provide users of Goldengate and 1-2-3 on the IBM Personal Computer with access to mainframe data within IDB. Symphony Link will deliver the same capabilities to Symphony users.

Both links will automatically reformat mainframe data into the appropriate formats for use within the micro software and will facilitate both data uploading to and downloading from the IDB component of ICMS.

The spokesman said that Lotus worked closely with Cullinet in the

development of the link portions. Cullinet will market ICMS as a stand-alone information center offering that does not require the installation of its IDMS/R.

The mainframe portion of ICMS is currently available and costs \$150,000. Both Cullinet's Universal Link and Symphony Link will be available in the fourth quarter. Universal Link will cost \$300. Pricing for Symphony Link has not been set, but the spokesman said it will be approximately \$300. Pricing for the departmental machine interfaces will be set by DEC, Wang and DG.

Cullinet Software is located at 400 Blue Hill Drive, Westwood, Mass. 02090.

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Justice monitoring bias in airline reservation systems

By Walsh Delle
CM Washington Bureau

WASHINGTON, D.C. — The U.S. Department of Justice is monitoring a new form of bias in airline computer reservation systems (CRS) and may have to seek divestiture of the highly successful systems if they are found to be monopolistic, an official told Congress recently.

The issue was explored at a recent hearing held by the U.S. Senate Subcommittee on Aviation, which is searching for remedies to the admitted bias in the reservation systems owned by United Airlines, Inc. and American Airlines, Inc., the dominant air carriers in the U.S.

The Civil Aeronautics Board

(CAB), before its demise last year, issued rules prohibiting an airline-owned CRS from favoring the airline's own flight schedules in the "primary display" (CW, Aug. 6). But at the subcommittee hearing, a Justice Department official said the airlines are providing travel agents with an automatic window feature that shows them a second display, which is intentionally biased in favor of the CAB owner.

"Bias of loophole"

Charles F. Rule, deputy assistant attorney general for antitrust, said the airlines have taken advantage of a loophole in the CAB rules, which are now administered by the U.S. De-

partment of Transportation. "The secondary screen phenomenon is a result of that loophole," Rule testified.

In addition to the secondary display bias, Rule said, the Justice Department is concerned about recent increases in the fees that American and United charge smaller airlines to be listed in the reservation systems. The high charges "may reflect monopoly prices," he testified.

"All options, including litigation and divestiture, are being held open," Rule said, adding that further regulation by the Department of Transportation would be preferable to divestiture.

Matthew Socomeo, the transporta-

tion department's policy chief, said that the CAB apparently believed that if travel agents had equal access to biased and unbiased displays, agents would opt for the unbiased one.

"It is now claimed that the continued availability of biased displays, coupled with mechanisms and [financial] incentives that make it less attractive to use primary displays, threaten to undercut the rules against bias," he testified.

Rule and Socomeo, however, said the government should not rush into further regulatory action but should monitor the situation for several more months and see how the CAB rule works.

But smaller airlines urged the government to take such quicker action to stop what they view as monopoly activity.

"Purpose of divestiture threatened"

Daniel May, president of Republic Airlines, Inc. of Minneapolis, testi-

fy

'All options, including litigation and divestiture, are being held open.'

— Charles F. Rule
U.S. deputy assistant attorney general

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flex: "In the CRS situation... market forces are not working, and the basic purpose of [airline] deregulation is threatened."

He said that the remedy is to prohibit airlines from owning CRS systems. "This can be accomplished either by sale or spin-off to existing stockholders," he suggested.

Executives from United and American vigorously defended their CRS ventures, arguing that their foresight and hefty financial investments in CRS have resulted in major improvements in service for all airline customers.

They said that the competitive advantage of display bias — or "preferential sequentialization" — was the original incentive for making the investments.

Robert L. Crandall, president of American Airlines, said his firm's Sabre CRS is the largest real-time commercial data processing and communications system in the world and "one of the great success stories of the modern free enterprise world."

"An awe-inspiring achievement"

"The system is capable of processing, at its central site, in excess of 1,000 messages per second, and in data processing terms that is an awe-inspiring achievement," Crandall told the subcommittee.

If he had to pull Sabre, Crandall said, "the purchase price would be large, because it is a profitable business, and it is not a business we [would] choose to get out of."

Crandall testified that he instituted of the secondary display feature only because United did, and said he would get rid of it only if his competitors did, too.

NEWS



WASHINGTON
DP World
Mick Bates
DP Washington Computer

Grace Commission's proposals get GAO nod

WASHINGTON, D.C. — The General Accounting Office (GAO) recently reported that it agrees with most of the cost-cutting recommendations of the so-called Grace Commission in the area of government computer operations.

The president's Private Sector Survey on Cost Control, chaired by industrialist J. Peter Grace, reported in January 1984 that the government has not effectively managed its information systems, resulting in obsolete and inefficient DP operations.

The GAO, in a report to the U.S. Congress, agreed with the Grace Commission about the need for improved management, leadership and technical support for government DP operations. For example, the GAO supported the consolidation of duplicate payroll systems and improvements in the procurement process.

GAO tells agencies to cut leasing costs

WASHINGTON, D.C. — U.S. government agencies, which spend about \$1.1 billion a year to lease computer hardware, could reduce costs on existing leases by refinancing the leases or buying the installed equipment, the General Accounting Office (GAO) reported.

A recent GAO report said the auditors had studied leases covering 340 hardware items and found that leasing alternatives would have produced savings of 25% to 70%.

The leasing alternatives, the GAO said, include the following:

- Purchasing hardware that an agency plans to keep for a long time.

- Refinancing a straight lease to reduce leasing costs, by means as a sell/lease back transaction, or replacing hardware with identical equipment leased from the used computer market.

- Exercising contractual options to change from a lease to an installment purchase.

- Replacing leased equipment with government-owned equipment no longer needed by another agency.

"DP managers at the civilian and defense installations GAO visited had not identified or pursued the various refinancing options open to them," the GAO reported.

The GAO urged the heads of federal agencies to require DP managers to conduct a cost-effectiveness analysis of all existing leases and develop a plan to employ the refinancing options described in the report.

Congressman skeptical of FBI data base plan

WASHINGTON, D.C. — Rep. Don Edwards (D-Calif.)

recently expressed strong reservations about a Federal Bureau of Investigation plan to expand its national crime data base to include an intelligence file of reports about suspects in white-collar crimes.

The FBI plans to expand the National Crime Information Center to allow federal, state and local law enforcement agencies to enter information about persons being investigated for serious white-collar crimes. Informa-

tion in the proposed Economic Crime Index could include unverified reports and police speculation about persons who have not been charged with a crime.

Edwards, who is chairman of the U.S. House Subcommittee on Civil and Constitutional Rights, recently wrote to the U.S. Department of Justice expressing concern that the expanded data base would include investigational data that is not in public records. He said it may be in-

accurate and would be widely available to law enforcement officers around the country. The FBI data base plan was also questioned by the American Civil Liberties Union.

"Certainly, we must fight crime at all levels in our society," Edwards wrote. "But we also have an obligation to preserve our fundamental constitutional liberties, including the right to privacy and the presumption of innocence."



NEWS

Optometrists write prescription for VDT eyestrain

By Hilsh Bates
Of Washington Bureau

WASHINGTON, D.C. — Concerned about VDT workers' frequent complaints of eyestrain, leading optometrists urged office managers to reduce sharply office lighting levels in an effort to cut glare. They also suggested that managers encourage rest breaks and job variety

and purchase VDTs with stable, legible screen characters.

The recommendations were made at the American Optometric Association's Symposium on Vision in the High-Tech Society, held here recently. One presentation, by Hicksville, N.Y., optometrist Lowell Glatt, recommended the use of lightly tinted polarizing glasses

that, he said, reduce glare and improve eye comfort for VDT workers.

The optometrists said VDT workers should receive regular eye examinations because VDT work can aggravate existing vision problems, even minor ones that do not affect much tasks as reading or driving, and because people who wear glasses or contact

lenses may need a special prescription for focusing on the intermediate distance of the VDT screen.

Blindness requires bifocals

Glatt said that bifocal wearers, who must tilt their heads back to focus on the VDT, should use wideband bifocal lenses for VDT work, with the middle band of the

lens focused on the VDT screen.

He also urged corporate managers to hire VDT workers based on their visual abilities. "If you needed a typist who could type at 100 words per minute, you wouldn't hire someone who could type at 50 words [per minute]," he observed, "so why should you hire someone who doesn't have the visual skills to do the job?"

Vernon King of the Purvis State College of Optometry in Big Rapids, Mich., said doctors of private and government VDT operations have shown that people who work on VDTs for hours on end are the ones most likely to suffer eyestrain.

He recommended rest breaks and redesigns of the job so that workers can use their eyes in different ways throughout the day. "It is the continual focusing on one task that puts stress on the eyes," he said.

Eliminate biggest glare

The top-ranked complaint among VDT workers is lighting glare from windows and overhead lighting, King said. On that subject, Donald Pitts of the University of Houston College of Optometry, made several recommendations for office managers:

- Use indirect lighting, install diffusers over fluorescent lights and use dimmer switches.

- Cover walls with low-reflectance materials in neutral tones.

- Use antiglare filters for the VDT screens as a last resort.

Pitts said most modern offices have three times more lighting than is appropriate for VDT work, and he strongly recommended ambient illumination of about 35-ft candles for VDT work.

Filter and filter

VDT purchasers should also specify terminals that reduce the jitter and flicker of on-screen characters, he said. Jitter is caused by an insufficient video refresh rate, which causes the electron beam to inaccurately when refreshing the character, Pitts said.

Filter and filter

Flicker, he said, is caused by a fast decay of the phosphor and a slow refresh rate. "Accept nothing below 60Hz [frequency]. A lot of VDTs are 45Hz, 60Hz, [or] 55Hz, which is not a fast enough refresh rate," Pitts said.

On the controversial subject of screen color, Pitts asserted that displays with black characters on white screens provide the most legibility, visual comfort and work efficiency.

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NEWS

Florida bill proposes electronic access into agencies

Residents may be allowed to tap into state records

By Susan Robinson
CW Staff

TALLAHASSEE, Fla. — Any Florida government agency that wants to give residents remote access to computerized records can do so if a bill pending in the legislature here passes.

The bill, introduced in the 1985 session, seeks to permit, but does not mandate, all local, county and state agencies to give remote access to their electronic records to any Florida citizen with a computer, said the director of a committee studying the issue.

Edwin Levine, staff director of the Florida Joint Committee on Information Technology Resources,

said the plan is not one of individual citizens dialing up to obtain little bits of information. The system he foresees is one in which high-volume users of information — such as real estate professionals and large law firms — will have a direct line to the host computer on which the records are being maintained.

Levine's committee was set up three years ago to address planning for and implementation of computers in Florida government agencies, said Sen. George Stuart (R-Orlando). Last year, the committee addressed computer security issues, and this year remote access is the primary issue, he said.

If the bill passes, access to government records will continue to be free for people who come in to an agency and ask for the records, staff director Levine said. The proposed computer-access legislation calls for remote-access users, however, to pay

direct and indirect costs to the agency from which they acquire information, so that the governments in Florida will not be in competition with private businesses that currently offer government information in a profit-making capacity.

The service would improve the quality of the state's computer systems, Stuart said, because needed equipment could be bought at the expense of the users and not at the expense of the taxpayers.

However, fees collected for this remote-access service would not revert automatically to the agency that guarantees the service, said Randy Buser, chief of the Bureau of Information Services for the Department of Highway Safety and Motor Vehicles.

All the money collected would go into general revenue, and there would be no change in the process of applying for more equipment, he said.

Common date set for spring meet

LOUISVILLE, Ky. — The IBM users group, Common, which claims to have members representing more than 3,000 IBM installations worldwide, will hold its Spring '85 Conference at the Galt House hotel here from April 27 to May 1.

Common's membership includes users of the IBM System/34, System/36 and System/38, Series/1, 4300 series and Displaywriter as well as the IBM Personal Computer, according to the users group.

During the conference, more than 250 presentations are scheduled on management and applications topics. The faculty of Northwestern University will present special management sessions that will be eligible for Continuing Education Unit credits.

The registration fee for members is \$120 in advance and \$160 at the conference.

For those who are not members of Common, the fee is \$200 in advance and \$230 at the conference.

Further information on the IBM users conference is available from Spring '85 Conference, Common, which is headquartered at Suite 1717, 485 N. Michigan Ave., Chicago, Ill. 60611.

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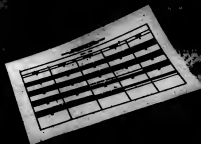
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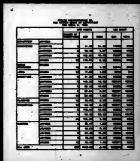
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NEWS

Arizona county to cut ties with DP services contractor

By Jeffrey Spector
CI West Coast Bureau

PHOENIX — Government officials in surrounding Maricopa County, Ariz., have voted to sever all ties with the independent DP services contractor that was overseeing the county's computing operations for nearly three years.

When the break with Sys-

tems and Computer Technology Corp. (SCT) is complete, the county will reportedly revert to its former practice of maintaining its own captive information systems organization.

But to ensure a smooth transition from third-party management to in-house management, the county's disengagement from SCT is

expected to be leisurely, according to Bill Handwood, the company's executive director.

Internal processing

For years, Maricopa County performed all its information processing activities internally. But in the early 1980s, the county's longtime computing services director

unexpectedly resigned to accept a position in private industry.

When a subsequent personnel search failed to produce a qualified successor, members of the county's Board of Supervisors entered into a contract with SCT, a computing services firm based in Malvern, Pa.

Roughly three years later,

a reconstituted board reversed the earlier decision and voted for SCT's eventual expulsion.

If the phantasmagorical search according to some of the county's business relationship with its outside services contractor will end in June 1986, according to Handwood.

Strains process slow

Both sides stress the need for processing the divorce slowly.

"You can't turn control of the computer services department back to the county all in one day, because the organization's management structure is now SCT's," Handwood said.

The demise of the county's DP services arrangement comes as little surprise to SCT. Each party originally intended the agreement to be temporary, and each expected SCT eventually to turn over the reins of the county's information systems department back to their owner, according to Handwood.

In fact, he added, the two sides insisted on including a "phase-back" provision as part of their original contract.

But the timetable under which the county would regain full control over its MIS destiny was deliberately left indefinite, Handwood said. Now, he is the warden of the Board of Supervisors' recent vote, the expiration date for the county's service contract is no longer open-ended, Handwood said.

'County at SCT's mercy'

What prompted the board to impose a firm cutoff date was a mounting suspicion that the arrangement "was placing the county at SCT's mercy," according to Dick Bryce, the governing body's executive assistant.

Ever since the contract took effect in May 1982, all the county's information systems employees have been on SCT's payroll.

In theory, therefore, the independent DP services company "could have shot down the county's entire computer operations," Bryce said.

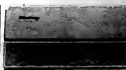
Although the likelihood of such a closing was considered extremely slim, "the board members still wanted to exercise more direct, day-to-day control" over Maricopa County's MIS organization, Bryce said.

Aside from their concerns about control, the board members found little to criticize in SCT's performance.

In fact, in a recent audit by a Big Eight accounting firm, the services vendor won high marks for its management of the county's systems operations, he said.

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NEWS

Package aids county's hunt for rape suspect

By Paul Rosenbloom
CI Staff

MIAMI — Investigators here have turned to a software package for aid in apprehending a man who may have raped as many as 40 women in the last 34 years.

The package, IBM's Storage and Information Retrieval System (Stairs), provides ad hoc storage and retrieval capabilities for a large volume of text or data.

IBM recently donated a copy of the package to the Dade County Computer Services and Information System here. "There have been a number of unsolved rape cases that may or may not be attributed to one person," Thomas L. McGovern, Dade County's MIS director, said. "Investigators are attempting to determine if there are similarities in the cases that may be traced to one person or a group of people. A package like Stairs may help to determine this." McGovern would not comment specifically on how the package may be used, fearing that publicity would jeopardize the investigation.

In 1981, city agencies in Atlanta used Stairs to aid in the search for the person responsible for the murder of approximately 36 children. Richard Silvey, systems programmer and research analyst for the city's Office of Management Systems, was a member of a special task force formed to aid the investigation. "Whenever there is a case like the child slayings, police have to work with a large amount of data," he explained. "A lot of people called the police with information and tips. The department needed a system to input data, store it in a data base and allow the officers to query the data base. Stairs provided this capability."

The package was used with the city's in-house arrest and incident tracking data base management system. For example, an investigator could have the system list all males who own red, compact automobiles. "If the system produced 7,000 records, an investigator could have entered qualifying data to produce a workable number of records," Silvey said. Silvey was not sure if the package helped lead to the man convicted of the slayings. "I don't think that the system produced one piece of information that allowed police to say 'That's our man,' but information about him was probably provided in some police records," the analyst noted.

When the child slaying cases were closed, Atlanta city agencies stopped working with Stairs, opting to use only the city's DBMS.

When Dade County began to evaluate Stairs, its IBM sales representative suggested that Dade County consult authorities in Atlanta. "Our IBM sales representative said that Dade County might call us, but they haven't called yet," Silvey noted. "We would be willing to work with them and show them how we established our task force, explain the functions it filled and illustrate how computers aided our investigation."

Bank saves time with software

PROVIDENCE, R.I. — A host of efficiencies have reportedly accrued for Fleet Credit Corp., the asset-based lending subsidiary of Fleet National Bank of Rhode Island, since it switched to on-line commercial finance software.

Fleet experienced a reduction of between 100 and 200 hours per month, compared with what had been spent in manual accounting and calculations — an average savings of more than 40 hours per week, according to Dennis Joyal, vice-president of the firm's business credit division.

Other advantages Joyal said the firm gained were access to on-line data to troubleshoot potential problems, the potential for loan managers to look at the components of entire transactions and the capacity to produce reports instantaneously, although most are printed out at night and delivered by 8 a.m. the following day.

No disruption of procedures

Fleet moved to computerization by getting its new software, including the Commercial Finance Package from Century Data Services, Inc. (CDS), on an IBM 3068 mainframe at its parent firm's headquarters. It has since found that new business can be handled by the system without disrupting procedures or requiring additional personnel, Joyal said.

The CDS Commercial Finance Package

tracks and monitors Fleet's revolving asset-based loans. It gives the institution's loan administrators daily on-line access to information on loans, yield and income, regardless of the size of the portfolio.

The software permits the bank's demand deposit accounts (DDAs) to interface with Fleet's Commercial Finance Program, Joyal said. Because customers of asset-based lending institutions often have accounts with the bank, Joyal said, Fleet finds it preferable to debit and credit their DDAs instead of billing them directly, he said.

Fleet Credit has offices in Atlanta, Dallas, Minneapolis and Newport Beach, Calif., he added, are now linked with the Commercial Finance Package on the bank's mainframe, but they can only read historical data.

Fleet's back office, Joyal noted, has also benefited from automation. Immediate posting of transaction data helps prevent overdraws, provides audit reminders and frees the staff for additional duties, he said.

When Fleet moved to computerization and adoption of the Commercial Finance Program, it decided to use the bank's IBM 3068 mainframe rather than purchase an in-house mainframe or mini-computer, Joyal said. The main reason, he explained, was security through standardization and economy; the potential to network terminals nationally was also important.

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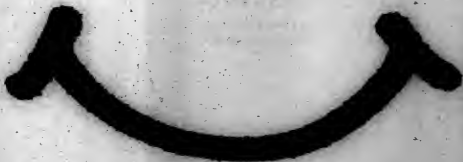
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possible. DEC, Wang and DG have all signed licensing agreements with us to develop and market ICMS links to their minicomputers.

And Lotus? ICMS is the "link" the company that developed Lotus' 1-2-3[®] and Symphony[®] has been looking for. The link that gives users of their products easy access to mainframe information. Last Thursday, Cullinet and Lotus announced a joint development agreement.

Of course, ICMS also works beautifully with GOLDENGATE, our own integrated personal computer package. A package designed to provide an optimum working environment for each of its functions—spreadsheet, database, word processing, graphics and communications.

It's an unusual day when DEC, Wang, DG and Lotus users are all smug about the same thing. But, then, as you can see, last Thursday was very unusual.

For more information about ICMS, phone us at 1-800-225-9930. In Massachusetts, the number is 617-329-7700.

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NEWS



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AUSTRALIA

BREBANE — Queensland's State Government Computer Center has ordered roughly \$5 million worth of Sperry Corp. computer equipment, including the Sperry 1100/85 system and seven communications processors. The Government Computer Center needed the Sperry 1100/85 system to cope with heavy processing demands, which have been increasing at an annual rate of 30%, a spokesman said.

JAPAN

TOKYO — Toshiba Corp. and Ford Co. announced an agreement under which the two firms will cooperate on future research and development. Reportedly, Toshiba gained a 57.5% interest in Ford and has provided Ford with a new vice-president in addition to semiconductor, office automation equipment and peripherals. The companies have agreed to concentrate on micro technology and will work jointly on future development, production, sales and marketing.

SINGAPORE

SINGAPORE — Operation of this

country's first national retail electronic funds transfer system is slated to begin in June. The \$2.5 million pilot project is called EFT at Point-of-Sale (EFTPOS). The company coordinating the program, Network for Electronic Transfers Pte. Ltd., was formed by the five major banks that own EFTPOS. The network software is being supplied by Cap Information Systems, a spokesman said. The hardware front-end of the project consists of a three-CPU Tandem Computers, Inc. Nonstop II system, along with 50 model 8675 FDS terminals from International Computers Ltd.

SWEDEN

STOCKHOLM — Swedish communications giant Ericsson AB is expected to announce two additional

products: the Spectrum portable Personal Computer and an enhanced version of the Alfabeta terminal line, which is compatible with the IBM 2870 Personal Computer. The Spectrum portable is said to resemble — with the exception of its screen — the latest offerings from Hewlett-Packard Co. and Data General Corp. It features a single 96-in. microfloppy disk drive and runs under Microsoft Corp.'s MS-DOS operating system. Pricing was not available at press time.

In an unrelated announcement, Ericsson reported that 1984 corporate annual revenue was down 11% from the previous year.

STOCKHOLM — Four out of five top Swedish executives never use personal computers at work, according to a report recently published here. In addition, some 51% saw no reason for executives to use personal computers on the job.

STOCKHOLM — The National Swedish Telecommunications Administration (NITA) will offer computer training to its staff of approximately 44,000. The employees will reportedly be offered the opportunity to participate in workshops and will be able to take home personal computers during the training period. Employees will also be able to purchase home computers at discounted prices through the NITA. "We want to prepare our employees for the information society and create an understanding of computerization," said Thorbjörn Burtha, head of the NITA project.

STOCKHOLM — Nordic Software AB has announced a software publishing and distribution agreement with U.S.-based QED Information Sciences, Inc. Nordic will translate and distribute QED's line of educational software for IBM Personal Computers and Apple Computer, Inc. Apple and Macintosh machines.

SWITZERLAND

ZUGERBERG — Computer Camp International, a San Francisco-based computer training institute, recently announced schedules for the first European computer camp to be held here. Two separate three-week sessions, designed to provide an in-depth introduction to the Apple Computer, Inc. Macintosh, will be conducted July 15-Aug. 6 and Aug. 9-24.

The program offers classes in Basic, telecommunications, choosing peripherals, expandability options and how to use common applications programs such as word processors, data bases and spreadsheets. The camp is open to boys 16-17, and classes will be conducted in English and limited in size to eight.

WEST GERMANY

STUTTGART — Hewlett-Packard GmbH here greeted its 25th year in business by posting record results. Its 1984 revenue was up 42%, and profits rose 36%, sources reported. The West German HP also hired 700 employees last year and turned approximately \$46 million in R&D. For the coming year, Chairman Eberhard Knobloch predicted a company growth rate of approximately 20%.

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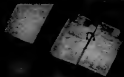
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Insurance company consults employees on terminals

MILWAUKEE — While most data processing directors base their terminal purchase decisions solely on cost, service and other factors, one of the nation's largest insurance companies considered the opinions of 180 employees before purchasing ITT Courier Terminal Systems, Inc. 1700 display terminals.

Northwestern Mutual Life Insurance Co. head here asked data entry workers from 48 of the firm's divisions to try out the low-cost, standard display terminals of two vendors — ITT Courier and IBM.

According to Jeff Dunn, associate director of information systems for Northwestern Mutual, the result of the tryout was a determining factor

in the company's decision to purchase 300 ITT Courier 1700 display terminals this past year.

"One hundred data entry workers compared the ITT Courier 1700 display terminal with the IBM 3178 display terminal. Ninety-eight percent of the users preferred the 1700," Dunn said. "We, of course, considered these statistics in our purchase decision."

Northwestern Mutual purchased the ITT Courier 1700 display terminals to replace its older Incoterm Model A60-61 display terminals at corporate headquarters. The terminals connect with an IBM 3081 QX running MVS with 24M bytes of main memory.

Chuck Poulis, Northwestern Mutual systems analyst and supervisor of the tryout, said the ITT Courier 1700 and IBM 3178 were selected because both ITT Courier and IBM were installed, compatible vendors at Northwestern Mutual.

Poulis said each tryout participant received a demonstration of each terminal and was then asked to perform a general insurance application. After working with each of the terminals, each user was asked three questions:

- Which terminal did you prefer?
- Why did you prefer that terminal?
- What features would you like to see on future display terminals?

According to Poulis, the users noted ergonomic features as the major reasons for their selection of the ITT Courier 1700 over the IBM 3178.

Features of the ITT Courier 1700 that were repeatedly mentioned in the comparison included the following:

- Physical size of the terminal.
- Clarity of the characters.
- Tilt and retrieval capabilities of the CRT terminal.
- Positive tactile keystroke.
- Separate 10-key pad for numeric purposes.

Quenda Piskala, tryout participant and unit head of terminal operations for Northwestern Mutual's loan department, said the compact size of the ITT Courier 1700 was important in her choice because she and other Northwestern Mutual data entry workers have small workstation areas.

"The compact terminal takes up

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ITT Courier 1700 keypad

less desk space and provides a more comfortable, efficient place to work," Piskala said.

According to Poulis, the separate 10-key pad was one of the most important features among the data entry workers. He said that in the tryout, data entry workers from all departments said they believed the 10-key pad was a necessity in their areas of work.

Gloria Vusick, tryout participant and supervisor of Risk Appraisal South, said several keyboard features were the deciding factors in her decision to choose the ITT Courier 1700.

"I thought the additional Enter key on the 10-key pad would be a time-saving device," she said. "Another feature I liked was the detachable keyboard. It had an extendable cable that let me place the keyboard up to five feet from the terminal."

Poulis said that data entry workers indicated a desire for more ergonomic features on future display terminals. "The most common response was for features that would reduce eyestrain and fatigue, such as a choice of color and varying character sizes," he added.

"We have some data entry workers that are on the terminals all day long. It's important for management to consider their needs when purchasing new terminals," Vusick said. "The fact that management let us be a part of the purchase decision meant a lot to everyone."

"Surveying the actual users was unique for our company," Poulis said. "We received very positive feedback from both supervisors and users."

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Other Code Compatibility	VS 15, VS 16, VS 17, VS 18, VS 19, VS 20, VS 21, VS 22, VS 23, VS 24, VS 25, VS 26, VS 27, VS 28, VS 29, VS 30, VS 31, VS 32, VS 33, VS 34, VS 35, VS 36, VS 37, VS 38, VS 39, VS 40, VS 41, VS 42, VS 43, VS 44, VS 45, VS 46, VS 47, VS 48, VS 49, VS 50, VS 51, VS 52, VS 53, VS 54, VS 55, VS 56, VS 57, VS 58, VS 59, VS 60, VS 61, VS 62, VS 63, VS 64, VS 65, VS 66, VS 67, VS 68, VS 69, VS 70, VS 71, VS 72, VS 73, VS 74, VS 75, VS 76, VS 77, VS 78, VS 79, VS 80, VS 81, VS 82, VS 83, VS 84, VS 85, VS 86, VS 87, VS 88, VS 89, VS 90, VS 91, VS 92, VS 93, VS 94, VS 95, VS 96, VS 97, VS 98, VS 99, VS 100	No only
Virtual Memory Operating System	Yes	No
Removable Storage Options	Yes	No
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NEWS

Boot maker's system sends waste walking

CLARKSVILLE, Tenn. — With the help of a manufacturing resource planning system, the world's largest boot-making company is striding confidently toward improved manufacturing operations and lower costs.

With manufacturing operations at eight plants in Tennessee, Texas and Massachusetts, Acme Boot Co. crafts

more than four million pairs of boots each year. The boots are marketed under a variety of brand names, including Acme, Diego, Don Post and Lucchese.

Acme maintains a data processing center at its manufacturing operations at its headquarters here, with an Amdehl Corp. 470V/5-11 mainframe running IBM's

OS/VS1 and VM/CMS under IBM's CICS. The data center also uses Cincom Systems, Inc.'s Total data base management system. Workstations in the remote manufacturing facilities are tied into the Amdehl mainframe via communications lines.

Acme offers more than 4,000 styles of boots with a host of different sizes and in-

dividual variations, and management must control a variety of materials in inventory. Much of Acme's manufacturing plant employs approximately 500 workers in a piecework incentive basis.

With the far-flung and diverse nature of Acme's manufacturing operations, the company encountered some nagging problems such as poor inventory turns, inaccurate paperwork, higher-than-desired labor costs and inadequate tracking of work in progress. In an effort to counter these, Acme decided to implement Cincom's Manufacturing Resource Planning System (MRPS).

Cincom's MRPS is a closed-loop production and inventory control system that incorporates seven functional modules:

- Inventory control.
- Bill of materials.
- Master production scheduling.
- Material requirements planning.
- Cost management.
- Shop floor control.
- Purchasing.

According to Larry Miller, director of manufacturing systems at Acme, prior to the implementation of MRPS, Acme workers used manually produced work tickets to indicate the completion of various steps in the boot-making process.

Today, Acme's workers use computer-generated work tickets that are more accurate and easier to read, Miller said.

"The work tickets provide the data that the payroll department needs to determine compensation for each worker," Miller said. "The migration to automated paperwork is definitely having a positive effect on Acme's direct labor costs."

What Miller labeled as indirect labor savings are also being realized with MRPS. At Acme, boots are manufactured in 12-pair cases and, at various points in the manufacturing process, a pair may be pulled from the case for defects or for reworking.

"In the past, when a defect — or 'huck shoe' — was identified, it still was common for our inventory to maintain the original 12 pairs, even though there were now only 11 pairs," Miller said.

Miller said the ability to track pairs of boots accurately throughout the manufacturing process has substantially reduced the indirect labor costs involved in reworking huck shoes.

According to Purchasing Manager Robert Bryant, annual inventory turn rates have improved since the company implemented MRPS.

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NEWS

Seafood chain hooks up with CAD to draw blueprints

LEXINGTON, Ky. — A seafood restaurant chain based here designs its outlets with the help of computer-aided design systems.

Long John Silver's Seafood Shoppes in neighborhoods across the nation have been designed with the aid of Cadmus, Inc.'s computer-aided design and manufacturing (CAD/CAM) Cadmus and a Spectragraphics Corp. terminal running off IBM mainframes at Jerrie, Inc. headquarters here.

Jerrie has more than 1,500 Long John Silver's outlets and another 74 Jerry's Restaurants throughout the U.S. In 1981, the company found its architectural drawing capabilities taxed by its rapid expansion.

Jerrie architects recommended a CAD system to reduce the need for original drawings and to increase architectural productivity. Standard areas in such restaurants, such as dining areas, kitchens and lobbies, would not have to be redrawn.

The search for a solution began in the fall of 1981. Three types of systems were researched:

- Microcomputer-based.
- Minicomputer-based.
- Mainframe-based.

The micro-based systems were ruled out because their storage capacities were too small to support Jerrie's long-term drawing storage needs.

A typical set of restaurant build-

ing plans contains approximately 30 drawings, some with up to six overlays per drawing, which would have quickly exhausted the limited drawing storage capacity of a micro system. In addition, microprocessor speeds at that time were too slow and could only accommodate simple drawing tasks.

Research into minicomputers led Jerrie to consider ComputerVision Corp., a vendor of turnkey CAD systems. ComputerVision's system's advantages included a special architectural engineering software package, high-quality drawing techniques, color terminals, a user-friendly programming language and a training package. The disadvantages of the

proposed system were its somewhat limited drawing storage capacity, limited data interchange with other Jerrie data bases and slower terminal response than a mainframe system. Additionally, significant investment would have required a second system.

Mainframe systems offered more promise. The IBM system ran Cadmus, a program that offered the speed and power Jerrie wanted. It also had the advantage of being compatible with Jerrie's IBM 4381 Model Group 2 host and with IBM terminals customized for rapid response. Thus, drawings through Cadmus could be shared with other Jerrie data bases, and all restaurant drawings could be stored on-line using IBM 3260 disk drives.

Cadmus's compatibility with IBM and IBM plug-compatible equipment, however, proved to be the deciding factor, leading Jerrie to launch a 13-month test of the IBM-based system. It included four IBM 3260 terminals, Cadmus software and a California Computer Products, Inc. black-and-white plotter. Jerrie said it believed at the time that it selected the best performing system for the money but soon discovered other alternatives.

Performance advantages

Six months later at a CAD graphics show, Robert Taylor, an associate architect at Jerrie, looked at Spectragraphics's System 1250 terminal and found that it offered performance advantages. It emulated the IBM 3260 monochrome stroke system and supplied IBM CAD/CAM users with the versatility of color and more displayable vectors. The System 1250 also provided a higher resolution display, real-time raster screen updates and a modular design that allowed several workstations to be connected without flicker or significant losses in controller performance. Also, input from keyboards, function switches, light pens and data tablets were all supported.

In addition, the Spectragraphics System 1250 incorporated the 3250 order set, plus its own expanded order set, which allowed for color designs and the generation of wide lines, large points and area fill.

Taylor, however, was most interested in the System 1250's upgrade capabilities and in particular its ability to support an upcoming release of Cadmus that would allow for up to 11 distinct shades of gray on a monochrome screen.

Taylor and Jerrie's data processing department discussed the matter and concluded that Spectragraphics' equipment was the best choice, because it allowed the company to grow with the future releases of Cadmus. The company installed four Spectragraphics monochrome 1250 terminals in May 1983, and recently Jerrie added another monochrome 1250 and a color 1250. Today, some 60 fully operational Long John Silver's Shoppes have been designed using a System 1250, and 10 of the company's 17 draftsmen on day and evening shifts use the 1250s full time.

Taylor said, "The ability to isolate and copy standardized elements is the key. Maximum productivity is based on making one original drawing do the work of dozens."

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5



RICHARD T. PALMER has been appointed vice-president of management information systems for the Colgate-Palmolive Co. His new responsibilities will focus on furthering maximum productive use of com-



puter technology in all facets of the company's business. Associated with Colgate since 1981, Palmer joined the company as director of MIS.

Prior to joining Colgate, he was president of administrative services at Bradford National Corp. for two years. He was previously with Merck & Co., where his last post was senior director of MBS. Palmer is a graduate of Wayne State University.



SUSAN STALEY has been named director of data processing at Execucall, Inc. in Cincinnati. She will have overall responsibility for Execucall's IBM System/36 computer.

Staley began her career with IBM and joined Execucall from the Delta Queen Steam Co., where she was data processing director.

She earned a bachelor's degree in economics from Wilmington College.

T. P. ORLOWSKY has been appointed director of management information systems for Transco Group, Inc. He is a specialist in systems design and analysis. In his position, he will design, program and maintain systems for Transco that apply to the transportation industry.

Orlowsky previously served as project manager for Panalpina, Inc. He has also been associated with Gran Colombiana, Inc., and U.S. Lines.

A graduate of the State University

Category:

of New York at Farmingdale, Orlovsky received an associate applied science degree in computer science.

Intech '85 expo scheduled

SAN FRANCISCO — Intech '85, the third annual Integrated Information Technology Conference and Exposition, will be held Aug. 26-29 at the Moscone Center here.

The conference will focus on business solutions in major user applications. Topics to be covered in lectures and discussion groups include information security, networks, personal computers, integrated voice/data networks and managing the technology. Representatives of Boeing Computer Services Co. will discuss strategy for migrating to standards. User case histories are scheduled from Westinghouse Electric Corp. and Ford Aerospace & Communications Corp.

The exposition will include floor demonstrations of integrated voice/data systems, personal computer-to-mainframe connections, personal computer local-area networks and advanced security technologies.

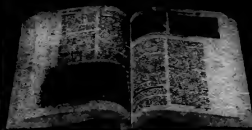
The conference also includes a two-part program on computer and communications alternatives with participation by IBM and AT&T system users and vendor technical personnel.

Registration fee for the conference is \$400, and admission to the exposition is an additional \$10.

More information is available from National Trade Productions, Inc., Suite 400, 2111 Eisenhower Ave., Alexandria, Va. 22314.

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NEWS



CALL FOR PAPERS

EXPERT SYSTEMS IN GOVERNMENT SYMPOSIUM

Madison, Va., Oct. 23-25

Papers are being sought for this conference sponsored by the IEEE Computer Society, Inc. and Mitre Corp. in cooperation with the American Institute of Aeronautics and Astronautics/National Capital Section. This conference will offer high-quality technical exchange and published proceedings.

Topics of interest include, but are not limited to, the following areas: professional applications, office automation, command and control, exploration, weapon systems, systems engineering, equipment, project management, flexible automation, software, architecture, imagery, education, entertainment and expert advice giving.

Completed papers are to be no longer than 30 pages, including graphics, and must be received by the program chairman by May 1.

Four copies of papers should be sent to Kamal Karna, Program Chairman, Mitre, 1930 Dalley Madison Blvd., Madison, Va. 22102.

Notification of acceptance and instructions for the preparation of manuscripts will be provided by May 20.

THE SIXTH INTERNATIONAL CONFERENCE ON INFORMATION SYSTEMS

Indianapolis, Dec. 14-15

The conference committee is accepting papers for this sixth annual conference. It is particularly interested in submissions concerning enterprise analysis/information systems planning; management of the information resources; methods for assessing the impact and/or effectiveness of information systems; productivity tools and support environments; integration of telecommunications, data base, distributed processing and office automation; development and use of knowledge-based support systems; issues in, approaches to and results of user-developed systems; contributions to and selection criteria of research methodology; computer-based education and training; and results of long-term, multiperson information systems research programs.

The program chairman must receive completed papers in triplicate no later than May 6.

The papers should not be longer than 25 printed, double-spaced pages, including

illustrations, tables and references.

They should be written in English and on one side of the page only, and authors' names should appear only on a separate title page. The program chairman will accept written requests for a more detailed style guide for the format of the submitted paper.

For additional information, contact Jeffrey A. Hoffer, Conference Chairman, Graduate School of

Business, Indiana University, 10th and Poe Lane, Bloomington, Ind. 47405.

INTERNATIONAL CONFERENCE ON COMPUTER-AIDED DESIGN (ICCAD-85)

Santa Clara, Calif.

Nov. 11-14

This conference will be oriented toward electrical engineering computer-aided design professionals, concentrating on CAD for integrat-

ed circuit design.

Paper topics include, but are not limited to, design and methodologies, CAD systems, interactive graphics, modeling and simulation techniques, design automation, layout and layout verification and testing.

All papers should be suitable for a 25-minute presentation and must not have been previously presented or published. Authors should submit 12 copies of both a one-page summary and a

more detailed description of up to 1,000 words in length.

Submitters should clearly identify the following information on the first page: the title of the paper, full author name and affiliation and complete return address and telephone number of the individual to whom all communications should be addressed. Submissions are due by May 10 and should be sent to Ian Gettem, ICCAD-85, P.O. Box 1972, Beaverton, Ore. 97075.

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NEWS

CALENDAR

WEEK OF APRIL 23

APRIL 23-MAY 1, MARCO ISLAND, FLA. — Fifth Annual Conference and Symposium on Security and Disaster Recovery Planning.

Contact: Nancy DeMott, IBM, Inc., 6800 N. High St., Worthington, Ohio 43085.

APRIL 23-30, DES MOINES, IOWA — Managing Information Centers 85-Secondly. Contact: Thomas Hines, Association for Systems Management, 94007 Dayley Road, Cleveland, Ohio 44136.

APRIL 23-30, LOS ANGELES — Software Configuration Management. Contact: Data Processing Management Association, Educational

Foundation Seminars, c/o Technical Training Corp., Department SCM, P.O. Box 3808, Torrance, Calif. 90510.

APRIL 23-30, NEW YORK — Information Centers. Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

APRIL 23-30, SAN FRANCISCO — CAD/CAM Data Base Users' in Conference. Contact: Jacques Cooper, CAD/CAM Alert, 824 Boylston St., Chestnut Hill, Mass. 02187.

APRIL 23-MAY 1, DALLAS — MYB Architecture. Contact: Acta Corp., 11910 Gate Way, Austin, Texas 78727. Also being held on May 13-15 in Memphis and May 23-31 in New Orleans.

APRIL 23-MAY 1, CHICAGO — Establishing a Computer Security Program. Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01552.

APRIL 23-MAY 2, WASHINGTON, D.C. — Super-

on Networks. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90405.

APRIL 23-MAY 3, SEATTLE — Ada Software Engineering Workshop. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90405. Also being held May 6-10 in Boston.

APRIL 23-MAY 3, NEW YORK — CCRB Internal Audit System. Contact: Syed, Inc., 35 W. 25th St., New York, N.Y. 10001.

APRIL 23-MAY 3, CHICAGO — MYB JCL. Contact: Syed, Inc., 35 W. 25th St., New York, N.Y. 10001.

APRIL 23-MAY 3, TORONTO — Designing Digital Communication Systems. Contact: Ruth David, Integrated Computer Systems, P.O. Box 45406, 6306 Arisoma Place, Los Angeles, Calif. 90045.

APRIL 23-MAY 3, WASHINGTON, D.C. — Implementing Local-Area Networks. Contact: Ruth David, Integrated Computer Systems, P.O. Box 45406, 6306 Arisoma Place, Los Angeles, Calif. 90045.

MAY 1-3, LONG BEACH, CALIF. — Artificial Intelligence and Advanced Computer Technology Conference/Exhibition. Contact: Tovar Conference Management Company, 351 W. Seely St., Wheaton, Ill. 60187.

MAY 1-3, ROCHESTER, N.Y. — Univ. Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Gerry St., Santa Ana, Calif. 92706. Also being held May 8-10 in Denver.

MAY 1-3, DENVER — Let's 1-8-4 Applications. Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940.

MAY 1-3, ANAHEIM, CALIF. — Local-Area Networks An Evaluation of Technology, Applications & Design. Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Gerry St., Santa Ana, Calif. 92706. Also being held May 8-10 in Cincinnati, May 15-17 in Hartford, Conn., May 20-22 in Denver and May 23-31 in Parsippany, N.J.

MAY 1-3, SAN FRANCISCO — Digital FETA. Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

MAY 1-3, DANVER, MASS. — Symposium on Small Systems. Contact: Fred Maryanski, EROS Department, University of Connecticut, Storrs, Conn. 06268.

MAY 2, CHICAGO — Building Security Awareness. Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01552.

MAY 2-3, SALT LAKE CITY — Using Phase III. Contact: The American Institute for Professional Education

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NEWS

MAY from page 30

tion, Carnegie Building, 100 Kings Road, Madison, N.J. 07940.

MAY 2-3, CHICAGO — Introduction to Communications Security. Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01532.

MAY 3, BELLEVUE, WASH. — Unix for Managers. Contact: Kathy Howard, Specialized Systems Consultants, P.O. Box 7, Northgate Station, Seattle, Wash. 98125.

MAY 4-5, NEW YORK — CICS Command-Level Intensive. Contact: Syed, Inc., 35 W. 36th St., New York, N.Y. 10001.

WEEK OF MAY 5

MAY 6, NEW YORK — CICS/VS

Internals. Contact: On-Line Software International, Inc., Port Lee Executive Park, Two Executive Drive, Port Lee, N.J. 07024. Also being held May 4, 10, 15 and 16 in New York and May 20-24 in San Francisco.

MAY 6-7, LOS ANGELES — CICS/VS Performance & Tuning. Contact: On-Line Software International, Inc., Port Lee Executive Park, Two Executive Drive, Port Lee, N.J. 07024. Also being held May 20-21 in Port Lee, N.J.

MAY 6-7, WAKEFIELD, MASS. — Software Rapid Prototyping. Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Dept. SEP, P.O. Box 3808, Torrance, Calif. 90510. Also being held May 9-10 in Orlando, Fla., and May 13-14 in Washington, D.C.

MAY 6-7, WASHINGTON, D.C. — Software Maintenance. Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Department SMA, P.O. Box 3808, Torrance, Calif. 90506. Also being held on May 9-10 in Boston and May 16-17 in Atlantic City.

MAY 6-7, HOUSTON — MVS Overview. Contact: Acta Corp., 11910 Geste Way, Austin, Texas 78727. Also being held June 24-25 in Washington, D.C., and September 8-10 in Austin, Tex.

MAY 6-8, BOSTON — National Data Base. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90405. Also being held May 13-15 in Los Angeles.

MAY 6-8, DALLAS — EDP Software Maintenance. Contact: Conference Manager, I.R. Professional Development Institute, 1580 Elton Road, Silver Spring, Md. 20903.

MAY 6-8, DALLAS — Networking Personnel Computers. Contact: Systems Technology Forum, 9000 Park Park Drive, Dallas, Va. 22015.

MAY 6-8, SAN FRANCISCO — Data Communications Systems Components. Contact: Systems Technology Forum, 900 Park Park Drive, Berkeley, Va. 22015.

MAY 6-8, WASHINGTON, D.C. — VMS: From Start to Finish. Contact: On-Line Software International, Inc., Port Lee Executive Park, Two Executive Drive, Port Lee, N.J. 07024. Also being held May 13-16 in Denver, May 20-23 in Los Angeles and May 28-31 in Port Lee, N.J.

MAY 8-10, HOUSTON — Structured Systems Design Workshop. Contact: Elise Habala, Learmonth & Burdett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77028. Also being held May 20-24 in Houston.

MAY 10-11, CHICAGO — The James Martin Seminar. Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

MAY 10-11, WASHINGTON, D.C. — Hands-On Programming in the C Language. Contact: The George Washington University, Continuing Engineering Education Program, Washington, D.C. 20052.

MAY 10-11, LOS ANGELES — X-50 and Packet-Switching Networks. Contact: Systems Technology Forum, 9000 Park Park Drive, Burke, Va. 22015.

MAY 10-11, SAN FRANCISCO — Local-Area Networks. Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402. Also being held May 15-16 in New York.

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VIEWPOINT

Technology offers hope for organ transplants



**LEONARD
SILVERSTEIN
Charles P. Licht**

I was riveted when I first heard that doctors had attempted a human heart transplant. If the transplant was a success, I wondered if any of us ever again could feel safely entering a hospital in which human heart transplants were practiced. And when the transplant turned out to be a success, the specter of human sacrifice materialized in the minds of thinking people everywhere; a human heart transplant requires at least one person to die for another to live. I've always considered human heart transplant surgery barbaric, and I believe I am not alone in holding this viewpoint.

It is unfortunate and illogical that recent attempts to perfect the implant of an artificial heart has brought the morality of the surgeon who undertakes this operation into question. One doctor whose patient died was forced to defend his decision to use an artificial heart instead of one taken from the chest of a dying person by citing a growing shortage of "qualified donors" and his need for immediate action. If his patient was to be saved, he should have been given a medal — as should the doctor who saved William Schroeder's life through the use of an artificial heart. Neither transplant attempts received someone else to die for the operation to begin.

Recent advances in very large-scale integration silicon chips provide every reason to believe that creating working simulations of just about every part of the human body may one day be possible. To our attention are focused on the heart, but we must remember that medical and computer scientists together have been making great strides by creating artificial eyes, ears, limbs, arterial systems, kidneys and the like — although progress in

this field is not proceeding fast enough. Most inhibiting is the lack of a marketplace as financially promising as business or military systems. Although approximately 35 million Americans (roughly 10% of the population) qualify as "severely disabled," a disproportionate number can't afford the kind of technological devices that may even partially reduce their afflictions. Only a dis-

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The evolution pattern of devices will give us a model for the creation of systems to support the severely disabled, including devices to replace organs and correct nervous disorders.

matic reduction in the research and development costs needed to create far more effective and cheaper devices can change this situation. Considering the price/performance improvements we've seen in our world of technology, this may occur in our lifetimes.

The evolution pattern of devices we've seen thus far in related fields will give us a model for the anticipated creation of systems to support the severely disabled, including devices to replace organs, correct nervous disorders and so on. For example, today's increasingly miniaturized video cameras offer hope for the blind that eye replacement is possible. These cameras — now comfortably carried around in a travel purse and weighing less than 5 lb — required a moving van just 25 years ago. The personal computer I use on board a trans-Pacific airliner weighed as much as 30 tons in the 1960s — consider the Eniac, for example. This same technology can be used to operate a robotic arm, and it is just a matter of time — and I hope not too long — before we can expect to see the cumbersome device that supports the Jarvik 7

artificial heart be made smaller so that both fit into a package no larger than the human heart they replace.

Complexities of technology abound

We cannot help but be impressed by the incredible developments we've seen in large-scale integration, but we cannot underestimate the complexities our scientific community faces in the use of this technology to create artificial parts of the body. The logic and sensory complexities of a single human cell are said to far exceed anything we may ever be capable of reproducing in our chip technology. And the information systems networks that our organs depend on to function may offer such an enormous degree of complexity that their reproduction is unobtainable outside the biological world. I assume we believe that this is true — which previously prompted our scientific community to search for organ replacement, especially organs deemed "vital," solely through the transplant of living organisms rather than through the implant of inorganic computer systems technology.

Perhaps we can unlock the mystery of how to grow a living heart, kidney, arm or leg in a laboratory, but the results of employing the discovery may not be as satisfactory as those obtained through the creation of artificial devices like the Jarvik 7. We cannot avoid realizing that, with proper engineering, the machine between failure of the technology's operation could far exceed anything nature has ever produced. This may resolve some people who fear the possibility of our eventual robotization, but it alone — even carried to the extreme — could never solve the problem. We've seen too many human robots emerge in our lifetimes without even a single artificial tooth gracing their mindless bodies.

If we knew how to reproduce our own body parts on demand, of course, the entire issue of how to correct failures in our physical functions would be set to rest once and for all. But until that day, the artificial organ replacements that emerge from a computer systems laboratory are far preferable to the real thing.

Leicht is chairman of Leicht Sciences, Inc., a New York-based think tank specializing in computer and communications technologies.

Unix evolves as a choice, not a standard



**WOLF STEIN
SILVERSTEIN
Arvy Wold**

Predictably, the entry of AT&T Information Systems into the information systems market has brought with it a new emphasis on Unix. However, interest in Unix — particularly as a multiuser OS environment for office users and office automation software — was already an important factor in the marketplace.

"Interest" is the key word here, because much of the promised software has never, in fact, materialized. Some software has died aborning; a little has reached the market (notably in bundled systems and in Quadra Systems, Inc.'s omnipresent Q-one and Q-office packages), and many packages are seriously overdue

but still promised.

What's going on? The following three separate (and intersecting) trends are occurring:

■ Much QA software has been (or

(and IBM itself on alternate Thursdays) are pressed to compete with AT&T Information Systems by offering Unix support.

But what does all this sound and

77

If we are going to have a half-dozen or more versions of Unix extant in the marketplace — each slightly different from the other and each optimized to a particular vendor's hardware — then we will have little or no portability and very little software.

is being) developed in the Unix environment, largely because of its availability, portability and familiarity.

■ Unix's seeming portability makes it an attractive target for software writers, who seek a reasonably large market, and for small hardware vendors, who must depend on third-party vendors for the software they need but can't afford to write themselves.

■ Non-IBM hardware vendors

fury about Unix portness? Probably less than starts the eye. To discuss the above-delineated trends, consider the following:

■ Much less Unix application software has been developed than was anticipated. In fact, about 80 Unix hardware vendors offer Quadra-tron's Q-one word processing software not because it's good (which it is), but because there's not much competitive product available.

■ Unix can only attract and encourage a large body of software if the portability of Unix-based software makes it usable across a broad spectrum of hardware offerings. If we are going to have a half-dozen or more versions of Unix extant in the marketplace — each slightly different from the other and each optimized to a particular vendor's hardware — we will have little or no portability and very little software.

Because it is likely that IBM will embrace the same Unix standard as AT&T Information Systems and the others, it is unlikely that a single Unix standard, strongly defended, will emerge.

■ Many commentators have confused IBM's reluctant support of Unix with enthusiastic endorsement. Do not expect IBM to be a strong Unix supporter. Big Blue considers Unix a defensive move, an attempt to ensure that not a single customer — based on his desire to use a Unix environment — moves from IBM's customer net to AT&T's. We expect IBM to continue to be a reluctant handmaiden at the Unix altar. It will surely support

See IBM page 44

Wold is president of Wold Associates in Boca-Cayman, Pa., and editor of "The Robot Report on End-User Computing" newsletter.

VIEWPOINT



LETTERS

Licensing options

The article "They shall not duke" (CW, Jan. 28) did not address the issue of current licensing restriction and its impact on end-user ability to apply the software in the application for which the

user purchased it.

The statement that data processing departments have grown up with license agreements but that users of microcomputer-based software have not and need to be brought in line assumes there is little difference between the two environments.

I am currently concerned with the accessibility of the licensed software. When software is licensed for a metaframe or microcomputer, the accessibility to that

software is limited only by the number and locations of the terminals and communications ports connected to the system. Although the software is limited to a single CPU, it is available to a large group of users.

Current software licensing for microcomputers attempts to follow the same practice of limiting the use of the software to a single CPU. But, as a result, the accessibility of that software is also limited, and this is where one of the

problems lies.

I am now working on an alternative project that uses three microcomputers to collect data, which will then be forwarded to a fourth for sorting and conversion to a standard format. If a licensed software package — such as a data base management system — is used to develop the programs required to collect the data on the central micro, three additional copies of the software package will need to be purchased

to allow the developed programs to be used on the other micros. It is difficult to explain to a client why this additional expense is necessary, especially when the software costs \$700 a copy.

Limiting the software to one CPU, in a case like this, seems inappropriate. An option in the licensing should provide additional copies to a single purchaser at a considerable discount, such as 10% to 20% off the price of the first copy, with consideration given to volume purchases.

Kenneth Jugoslav
Hickory Hills, IL

SCIENCE/SCOPE

After achieving from 87000 miles per hour to subsonic speeds in just two minutes, NASA's Project Galesburg Probe will take the first direct samplings of Jupiter's atmosphere later this decade. During its plunge through the brightly colored clouds, much of the Hughes Aircraft Company probe's forward heat shield will be eroded by temperatures of several thousand degrees. Once the probe has slowed, a sensor in the rear heat shield will fire to deploy a parachute. This parachute will pull off the back cover, releasing in turn the main parachute. Small explosives will release the front heat shield from the descent module. The parachute will slow the descent as the shield continues into the interior of the planet. Data will be transmitted to an orbiting spacecraft for relay to Earth. Project Galesburg is set for launch in May 1986 and is scheduled to arrive in August 1988.

An antenna system made entirely of composite materials is operating on LEASAT, a communications satellite launched last year from the space shuttle. The antenna's structural elements and fittings are made of carbon powder, fiber, and epoxy. This approach eliminates metal pieces that cause spurious signals when impinged by many different high-energy radio signals. The carbon powder also improves the conductivity of the outer surface of the antenna and prevents arcing, the harmful build-up and discharge of static electricity. Hughes built the 75-ton LEASAT for operation by a subsidiary, Hughes Communications Services, Inc. The Navy leases capacity for all U.S. military services.

A new 5-volt-only, 256-bit nonvolatile random access memory combines the data retention capabilities of an EPROM with the convenience of a CMOS RAM. The Hughes circuit, designated M1300, is designed for such applications as reconfigurable systems and flash protection without battery back-up. It is organized as 64x4 bits. Both the read and write operations are performed as in a standard CMOS RAM. A single store operation transfers all data in the RAM cells in parallel to the background EPROM array. The recall operation restores data in parallel to foreground RAM cells.

A new laser that better penetrates battlefield smoke, haze, and dust will let tank gunners determine the range of any target they can see with a thermal imaging system. The laser is the first carbon dioxide laser rangefinder developed in the U.S. for tactical military applications. It determines range based on the few milliseconds of a second it takes a laser pulse to reach a target and reflect back. During advanced development tests, the rangefinder demonstrated greater performance under obscured battlefield conditions than the solid-state lasers currently used for military rangefinding. Because the laser and the thermal imaging system operate in the same wavelength, they have the same performance characteristics under battlefield conditions and bad weather. The Hughes laser is also harmless to the human eye and can be safely fired during training exercises. A development model has been configured for evaluation in the M1 Abrams main battle tank.

Career growth opportunities exist at Hughes Support Systems for a variety of engineers qualified by degree or extensive work experience. They include systems engineers, radar engineers, and software and hardware design engineers for major simulation and test equipment programs. Also, field engineering positions throughout the U.S. offer travel, autonomy, and responsibility for the life cycle of Hughes electronics systems. Please send your resume to Lowell Anderson, Professional Employment, Dept. S3, Hughes Aircraft Company, P.O. Box 9399, Long Beach, CA 90801-0463. Equal opportunity employer. U.S. citizenship required.

For more information write to: P.O. Box 10000, Dept. 04-04, Hughes Aircraft Co. 90800

Computerworld welcomes letters from its readers. Preference will be given to typed, double-spaced letters of 150 words or fewer. Letters may be edited for the purpose of clarity and brevity. Letters should be addressed to Editor, Computerworld, Box 980, 375 Commonwealth Ave., Framingham, Mass. 01701.

UNIX

From page 43

Unix, and it will surely continue to promote IBM solutions to customers, encouraging IBM software from third-party vendors. When the dust clears — which will take far longer than anyone thinks — we should expect the following: in Unix as a second standard (second to IBM's de facto standard, that is) with most hardware vendors providing support.

Some Unix QA software, although much QA software will stay outside of the Unix camp because of vendor love for proprietary operating systems, the performance problems for this I/O-hungry application and IBM's failure to set the tone by strongly encouraging Unix software (the phrase "dancing with faint praise" springs to mind.)

The possibility that IBM will propose another proprietary (at least partially open) operating system to succeed its PC-DOS. This will, of course, become an immediate de facto standard, particularly if it permits current PC-DOS software to run under it.

Unix as a standard will be shared if proposals from January's Uniform conference to create a set of Unix extensions — each optimized to a particular set of applications — should materialize.

In the end, Unix will take its proper place in the marketplace not as the standard but as one of a series of choices. It will be useful where its tools offer advantages and passed over where and when newer products (particularly those blessed by IBM and its central property) enter the market and become accepted.

HUGHES

SOFTWARE & SERVICES

SOFTWARES GILLIAM

Is the thrill gone for DP achievers?

Many of the data processing professionals with whom I have contact are frustrated with their careers. The challenge of new technology, which was so important in earlier days, has lost its appeal. For some, boredom is prevalent. For others, the pace has quickened, but the same tasks are repeated. Many have no specific goals and believe their careers are flowing in no particular direction — or worse yet, in no direction at all.

Maybe you have been in DP for several years and have begun to wonder if you made a mistake because your professional program seems to have stalled. Or maybe you are just getting started in computing and are searching for the secrets that will lead to an enjoyable and rewarding career. A

See **ENR** page 51

Gilliam is an independent consultant based in Painesville, Ohio, and a regular contributor to *ENR*.



ADL putting AI technology to work

The corridors are narrow, and the painted cinder block offices that house Arthur D. Little, Inc.'s (ADL) Artificial Intelligence Program are cramped, but the significance of the applied research under way there extends far beyond the less-than-palatial accommodations.

At ADL's Cambridge, Mass., headquarters, AI is leaving the comfortable laboratory environment, which has been its home to date, and going out into the working world. Wearing the many-colored robes of consultants, researchers at ADL's AI program are applying AI to problems of the real world — turning advanced techniques into actual applications for a variety of industrial clients.

Perhaps it would be more accurate to say the AI program is putting AI technologies to work, for

See **AI** page 50



Lowell Jay Arthur

"Count what is countable, measure what is measurable, and what is not measurable, make measurable."

— Galileo Galilei

he desires to measure — to quantify and classify the components of the physical world — is a basic human trait. The ability to measure has fueled past technological advances by shedding new light on the pieces of the puzzle of nature, contended author Lowell Jay Arthur. Thus, it is appropriate that Arthur opens his most recent book, *Measuring Programmer Productivity and Software Quality* (John Wiley & Sons, New York), with Galileo's charge to the scientific world.

Arthur may be described as a proponent and missionary of the cause of programmer productivity and software quality measurement — also known as software metrics. Software metrics is the latest weapon in the continuing battle to improve applications quality and increase productivity. But despite man's obsession with measurement, the principle of software metrics has not been adherents in the software development world. "There are in-

struments to measure almost every principle and practice in most fields," he wrote, "but not in software development and maintenance. . . . And the only way to ensure high quality and productivity is to measure products as they are produced."

Arthur, who also wrote *Programmer Productivity* (John Wiley & Sons, New York), is a programmer productivity analyst for Mountain Bell Telephone Co. in Denver. He discussed software metrics in a recent interview with John Galland, *Computerworld* Senior Editor/Software.

Define the term software metrics.

Software metrics is simply the attempt to develop measurement tools to identify quality characteristics in software and to use those measurements, in turn, to develop productivity measurements. It is an attempt to

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■ An IBM mainframe data retrieval tool debuts from Informatics General/47

■ Harris gives its supermini-computer line software for computer-aided engineering, design and manufacturing/47

■ Language Processors introduces high-level language compilers/47



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PC Magazine February 19, 1985

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Computer Buyer's Guide and Handbook
November, 1984

"...if an office is looking to step up to across-the-board integration with a multitude of functions... this is the one program to seriously consider."

Personal Computing
March, 1985

"Offering true integration among all of its applications modules... [Enable is] a powerful production tool that can serve everyone in the office, from data entry personnel to the vice-president of marketing. Each module could stand as a full-powered application in its own right."

PC Magazine
February 19, 1985

"Enable, a five-function integrated system from The Software Group, merits a close look by any individual or organization interested in a solid package that is well balanced in all of its applications."

Popular Computing
March, 1985, Paul Goldfarb, Raymond Hood, Yoram Livson, Michael Wilding

"Quite simply, this package has so many outstanding attributes that even the worst skeptics of integrated software have to be impressed. The spreadsheet is very close to 1-2-3; the word processor combines the best thinking of WordStar, MultiMate, Volkswriter, and EasyWriter; the data base offers the functionality of dBASE II, but with many of the ease-of-use features of PowerBase; and the program offers business graphics and telecommunication. Taken as a whole, Enable surpasses the functionality of Symphony, Framework, Aura and Open Access."

IBM PC Update
December, 1984

Enable first in "Performance" rating—including speed and capacity of all modules tested. Enable first in "Versatility" rating—including power and functionality of all modules tested. Enable rated first in overall evaluation of the word processor module.

Software Digest Ratings Newsletter
Rating of 15 Integrated Products
December, 1984

"Enable welds its five applications together with outstanding integrity—yet each is exceptionally full-functioned in its own right."

Business Computer Systems
January, 1985

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Infoworld
January 21, 1985

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SOFTWARE & SERVICES

Harris offers CAD software package for supermini line

PORT LAUDERDALE, Fla. — Harris Corp. has announced a design, drafting, engineering and manufacturing software system called HarrisCAD that runs on Harris supermini computers ranging from the Harris 60 to the Harris 1000.

According to a vendor spokesman, HarrisCAD enables users of computer-aided design and manufacturing systems to go from design concept, drafting and analysis to manufacturing on one system. HarrisCAD resides on a common system data base included with the package and provides functions that include numerical control and data base management.

A menu-driven package, HarrisCAD features separate software modules that handle various mechanical engineering tasks. All modules are linked by the common data base and feature interfaces to complementary software packages.

HarrisCAD modules include a drafting system, a three-dimensional design system, a manufacturing system, a specialized applications system for modeling and analysis and an integrated design, drafting and manufacturing system. HarrisCAD can interface with two other software packages: PDA Engineering, Inc.'s Patran and Sysman Analysis Systems, Inc.'s Ansys. Patran is a solid modeling and finite element analysis and postprocessing program. Ansys is a finite element

analysis program for stress, thermal, dynamic and dynamic response analysis.

The price for HarrisCAD ranges from \$65,350 for a full HarrisCAD system, including drafting, design, drafting and drafting/numerical control modules on a Harris 60, to \$130,000 for those modules on a Harris 1000. The Harris supermini computers run the company's Virtual Operating System.

Harris' Computer Systems Division is located at 2101 W. Cypress Creek Road, Fort Lauderdale, Fla. 33309.

On-line retrieval tool for IBM data bases out from Informatics

WOODLAND HILLS, Calif. — Informatics General Corp. has announced Answer/DB-Inquiry for on-line data retrieval from any IBM mainframe data base.

According to a spokesman, Answer/DB-Inquiry provides mainframe terminal users with access to production IBM VSM data sets and IBM IMS/DB or DL/I data bases through CICS/VS and IMS/DC under DB/VS or DOS/VSE.

Answer/DB-Inquiry allows users to retrieve information with English syntax queries. Up to 10 data base files can be opened and viewed at the same time, including any combina-

tion of DL/I and Vsm files.

Answer/DB-Inquiry reportedly processes user-defined requests and output statements and displays requested data on the screen or routes it to a printer. Data base security against unauthorized access is provided through user profiles, the vendor said.

Answer/DB-Inquiry costs \$30,000 for the DB/VS-compatible package and \$15,000 for the DB/VSE package.

More information on Answer/DB-Inquiry is available from Informatics, which is located at 2100 Ventura Blvd., Woodland Hills, Calif. 91364.

LPI announces compiler line

WALTHAM, Mass. — Language Processors, Inc. (LPI) has announced a family of high-level compilers for Cobol, RPG-IV, Pascal, C, PL/I and Basic aimed at systems utilizing the Motorola, Intel MC68000 microprocessor and AT&T's Unix.

A company spokesman said the line encompasses LPI's Component Architecture, a modular design combining a front end, an optimizer, a code generator, a runtime library and a high-level debugger. The compilers use the same core method to handle data files, so programs written in one language can address and use files written in another. The architecture also allows single programs to be written in more than one language, a feature supported by the LPI-Debug multi-language debugger.

LPI-Cobol meets the Ansi 1974 high-intermediate standard, with extensions to allow users to transport programs written for IBM S/36 series CPUs using Cobol-68. LPI-RPG-IV is compatible with System/34 minicomputers, so that users can transport RPG-IV programs to their MC68000-based system.

LPI-Pascal implements IEEE/Ansi standard Pascal, with extensions designed to speed program development.

Each LPI compiler module is priced at \$60,000.

LPI is located at 400-1 Totten Pond Road, Waltham, Mass. 02154.

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SOFTWARE & SERVICES

AI team page 45

even the program's director, Karl Wig, is hard-pressed to define the subparformers turn artificial intelligence.

"I do not know what AI is," Wig acknowledged during a recent interview. "But I think we do know what the AI technologies are. They are the products and techniques that fall out of the horns of plenty of AI research. If you ask what AI itself is and is not, you get into a semantics debate that leads nowhere. We think, rather, about the use of AI technology for applications, and we try to make those applications as knowledgeable and intelligent as possible."

Applications key

The significance of ADE's AI undertakings can be summed up in that one word—applications. Many people, especially those in the traditional information systems world, have sharply criticized AI researchers for dwelling too long on the leading edge, for not handling the fruits of their labors down from their lofty academic sphere.

But some AI researchers contend the traditional DP shop is not yet an appropriate environment for leading AI technologies. They reason that current hardware and software architectures are not designed, and were not intended, to support the radically different processing and programming requirements of technologies such as expert systems and natural language interfaces.

Others state that until AI-dedicated tools such as Lisp machines become affordable to a wider corporate audience, add until mainstream manufacturers like IBM begin to offer AI-related support tools such as Lisp compilers for their processors, AI cannot hope to gain a foothold in the information systems world.

There is also a small minority of AI aficionados who question whether AI technologies can, or should, ever meld with DP. Whether from academic hubris or just plain disdain for traditional information systems, that minority would have AI remain untainted by DP. "There are a number of AI people," Wig stated, "who do not recognize that DP has anything at all to offer."

Weathering possible

Thus, it is remarkable that ADE's AI program has been as successful to date in surging AI and conventional information/knowledge processing technology. In certain cases, Wig and his colleagues admit, that blending can result in some weathering of an AI application transplanted to a DP environment.

For example, an expert

system developed in Lisp on a Lisp machine and cross-compiled to C or PL/I to run on a mainframe loses much of its flexibility to change and adapt to new knowledge. Knowledge maintenance, so to speak, must be undertaken in the Lisp environment and the system once again must be ported to the conventional language. The application also becomes opaque, AI researchers claim, making it difficult for users to discern just how the

system reached the conclusion it did. When it comes to expert systems, that reasoning process is every bit as

important as the answers the system generates.

While that degradation is a concern to AI program staff members, they remain cognizant of the massive investment U.S. industries have made in the current

generation of information systems. Wig said that, with ADE's help, clients have been successful in developing AI applications that either make use of existing systems or provide a functional or financial return high enough to warrant investment in dedicated AI hardware and software. The trick, they say, is not to become enamored of the technology but to carefully explore where it can be applied to improve operations.

That is a message that other AI researchers, at least those who would like to embrace the corporate audience, and AI product vendors would do well to heed. With this idea in mind, they could perhaps win a greater constituency within DP and spur interest in, and acceptance of, AI technologies. Shaking the information systems world can only spawn conflict and slow the adoption of the powerful, if still formative, AI technologies.



SOFTWARE & SERVICES

BORED See page 48

Fresh look at the key factors of success in DP may be just what you need.

Your definition of success and your goals will probably change many times throughout your career. As you achieve one level of success, you must set new goals as you may reach your full potential. If you do not have a goal to shoot for, how will you know when you hit it? There is a difference be-

tween education and training. Formal education is required if you are to have a reasonable chance of obtaining your goals. For example, someone in computer operations who wants to go into programming may have limited success without a college degree. A master's degree in computer science usually prepares a person for greater responsibilities than does a bachelor's degree. If you have set your sights on a position in man-

agement, a master's degree in business administration may be valuable.

But formal education is only part of the preparation for a career. You should strive to hone your skills and knowledge base up to date throughout your career by undergoing training — and opportunities for that training abound in our industry. Your education will set the framework for your career, but the application of trained skills will move you

up within that framework.

We need to be honest with ourselves about our natural talents and abilities. Attempting to accomplish outstanding feats in any field for which we are not skilled is frustrating, unenjoyable and unsuccessful.

The difference between a positive attitude of support and contribution and a negative, task-focused and complaining attitude can be counted in the money earned over the many years of a

career. A negative attitude repels, but a positive attitude sets in motion everything to boost the strength of those who want to help you succeed.

Successful people have an intense desire to excel. That desire is called drive, which is both a physical and mental condition. Withstanding the pace and pressure of a career in information systems requires much energy and stamina. Good eating habits and regular exercise pay rich dividends in providing energy with the strength to perform when others lag. That extra measure of energy and desire could be your ace in the hole — the difference between you and your competitors.

Success in any field requires an above-average investment of time, and DP is no exception. The number of hours you devote to your career each week is a key factor in determining your advancement. Employers look

SYSTEM V

99

Education will set the framework for your career, but the application of trained skills will move you up within that framework.

for people willing to give that extra time. Be careful not to work beyond a reasonable level, though; that can lead to physical or mental fatigue, which hampers your effectiveness.

Usually, those who advance in an organization view their responsibilities as more of an owner than an employee. That is, they become personally concerned with the success of the business. They continue to look for ways to make the business more successful, whether or not it benefits them directly. Commitment separates the successful from the unsuccessful.

Most outstanding achievers in the computer field effectively use their time by planning, organizing and prioritizing their activities. A calendar, task list and daily planning time will help you in this area. The calendar reflects your commitments and due dates; the task list shows the specific activities you need to address; and the daily planning time is for updating the calendar and task list and for setting time priorities.

Setting goals and planning a path to reach them is not a one-time exercise. Occasionally, you should prepare a progress report to assess your performance. That report may highlight an area on which you should place renewed emphasis.



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SOFTWARE & SERVICES

ARTHUR from page 62

quantify the quality of whatever is being produced rather than going through laborious manual processes, line inspections and walk-throughs.

■ You state that measures must often involve a subjective evaluation. Does the use of metrics sometimes cause resentment or a backlash on the part of those being measured?

You have to remember that most people have not been measured in the past. Consequently, they want to be certain they are being measured on a reasonable scale. People have to get used to the units of measure and, in their own experience, validate these measures. The general public right now accepts pounds and kilograms, but people have problems when you mention, say, lines of code or some other measure. They have heard that lines of code do not always work, so they try to discredit the measurement because they aren't ready to be measured yet.

■ How can that be overcome?

Basically, it takes some management skill. You have to convey the message that metrics is a tool that you want people to consider as a professional improvement in their jobs, a way for them to improve the quality of their code and become better from a systems analyst or programmer standpoint.

■ What are the primary products or measures used in software metrics?

They fall into two basic classes: size and complexity. From a size standpoint, countable lines of code — all the verbs in a given module — is one fairly good metric of size. As programs get larger and larger, with more than 300 to 500 countable lines of code, they become very multi-functional. There are all kinds of bad things that can occur in such large systems.

Most of the complexity measurements have evolved around decisions. Decisions are the things that send you down one path or another, and at every branch in the process you add a little complexity. Decisions are statements such as IF-THEN-ELSE, DO-WHILE or DO-UNTIL.

■ Once a development group begins using metrics, how long is it before improvements in program reliability or reduced maintenance become noticeable?

That is a function of finding a champion within a group who is willing to look at and use the tools. Once

you get a champion, the champion then sells it within the work group to everyone else. That champion is the person who is willing to do a rigorous job of building a new system or taking an old program and doing preventive maintenance on it, taking out as much size and complexity as possible.

■ Given mankind's obsession with statistics, why has the use of metrics not really caught on?

Predominantly, because it has resided mainly in the laboratory environment. It has been done in big shops where you can collect all the necessary data and statistics to show that something is a valid metric. The research findings get published in things like the IBM Systems Journal, which not all people read. The other side of the coin is that management,

for a long time, has not been concerned with quality; it has been concerned with getting a product out the door at a certain date. As long as there is a lack of concern about quality, there is no reason to invest in building these tools to aid and abet the programming task.

■ Does it require special training in metrics or certain management skills to implement metrics successfully?

It requires a lot of human factors skills. The society you are going into is not used to being measured. So, in general, it is going to use that as a threat. You have to also be a pretty good technician to get all the necessary information from the various sources and put it into a program that will do these measurements automatically.

■ Because some of the benefits may be further down the road, does that make it difficult to sell the metrics concept to management?

If you are mealy, you sell it as a means of measuring productivity. Or if management is really hot on quality, you sell it as a means to measure that. If you start measuring, collecting this information and tying it into people hours, total dollar costs, total computer usage — creating some productivity statistics — management will buy off on it.

■ What are some common problems software organizations encounter when they first apply metrics?

The most common [problem] is that when you put in a test file metric, see ARTHUR page 64

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people expect it to be perfect. But measurement is an exact science. Your measuring tool is only as good as the current state of the art. People want exact tools, and this is not yet an exact science.

Is the focus of metrics primarily on improved quality or increased productivity?

It is on quality. If you can identify your quality problems and fix them, you are going to get significant productivity increases. The more quality problems you fix, the better off you will be. There is a cadre of programming gurus who have agreed that certain [common] like GOTO cause problems later in maintenance. If GOTOs are causing 10% of your program logic problems, and you get rid of

them, you will recover the costs of downtime and repair.

Will burgeoning maintenance costs eventually force management to meet organizations to adopt the use of metrics?

I believe so.

Are the results of software measurement useful in helping DP managers explain the problems of quality and maintenance to senior management?

Absolutely. The DP manager will complain that he has to devote three or four people a month to maintaining one program. That is ridiculous. But the manager can never get the customer from upper management to go in and do something about it. Management says, "Just keep it running; keep it alive."

With metrics, you can develop numbers and measures that quantify what is wrong with the program and explain to management that you are going to take out this or that or make it more modular. At the end, you can show that you succeeded in these goals and that now, say, only two people have to maintain the program. Management will see the gains and will begin to invest more in quality. Metrics can be a tool to quantify what is wrong and to show that you are succeeding at repairing it.

Are there currently adequate tools available in the marketplace to support the use of metrics, particularly the automation of it?

There are no metrics programs available to my knowledge. Most things today are experimental measurement tools built by larger organizations trying to get a handle on these things. I don't think anything has matured into being a product, but they are fairly easy to build in your own environment.

Does adherence to metrics and strict quality measures meet into the art and creativity of programming?

Not really. You discover that the super programmers — those who turn out the modular, maintainable, structured systems — have learned what the best programming style is. They are extremely creative people because they have found the best way to do something. Metrics allows you to identify what the super programmers do and translate that into training to bring other programmers quickly up to that level.

Are there any software development environments to which the use of metrics is not applicable?

Not that I know of.



"And this one has even been a ghost host on the Tanglefoot Show."



In search of a printer

By Vincent Cavo

Now is a difficult time to shop for electronic page printers. The low end of this market is just evolving as a result of the recent introduction of low-cost print engines. As often occurs, the software to support new products lags somewhat behind. Consequently, some printer features or operational environments may not be supported initially, and there may be no standards.

The American National Standards Institute is now trying to establish some form of standardization for the laser printer industry. Eventually, this effort should simplify the se-

lection of printers.

The best way for a user to survey the market is to proceed as follows:

- Develop an understanding of the equipment.
- Identify equipment sources.
- Establish a basis for comparison.
- Collect equipment specifications.
- Identify user requirements.
- Correlate user requirements and equipment capabilities.

In at least one instance I know of, the organization failed to examine the requirements of

IN DEPTH/SEARCH FOR A PRINTER

its users thoroughly enough. As a result, it had to get a second printer simply because the first did not support a particular character font. Buying the second printer (after three months of attempts to tailor the first one) proved more cost-effective than investing additional resources in upgrading the first.

In my search for a minicomputer printer that could be used as a peripheral, I considered primarily laser print-

ers but also magnetic, ion and LED types. Each is built around a core that is essentially a paper photocopier engine.

The significant difference among these printers is the technique used to charge the surface of the photocopier's drum or belt prior to the application of toner or ink. Two common types of lasers used in the laser printers are gas (for example, helium-neon) and semiconductor diode. The latter type of laser

is also utilized in fiber-optic communications.

Generally, each type of printer makes use of the electrostatic printing process, which in turn relies on the xerographic or dry-copy technique. In this process, fine particles of toner are deposited onto a metallic surface. The segments covered by the charged particles form an image of letters, numbers, lines or graphics. The images are bound to paper by a combination of heat

and pressure as the paper comes into contact with the electrostatically sensitive drum or belt.

Laser printers have been commercially available for about 10 years. However, their cost prevented widespread use. Typically, high-end laser printers capable of printing 60 to 100 pages/min. commanded price tags of several hundreds of thousands of dollars. Their speed, 10,000 to 30,000 lines/min. as compared with the few thou-

sand lines per minute for conventional mechanical printers, makes them cost-effective in some applications and hence justifies their high price (for example, in the insurance industry). Recent technological advancements and new designs significantly reduce costs to the point where low-end laser printers, capable of printing five to 50 pages/min. can be purchased for from \$4,000 to \$10,000.

Magnetic, ion and LED printers are recent entries into the marketplace and represent alternatives to the technique used to charge the printer's drum surface. Product offerings are limited, though, and their cost currently exceeds the cost of comparable laser-based printers. The proclaimed advantages are increased reliability and lower maintenance costs, primarily because of considerably fewer moving parts.

The dumb photocopier printer, lacking a local processor, relies on the host computer to fulfill any processing requirements the printer might have, such as the rasterization of output data. These printers rely heavily on the host computer and require more interaction with the host than do the intelligent printers.

On the other hand, intelligent photocopier printers have both a local processor and considerably more local memory (random-access memory, read-only memory, bit map, floppy disk and so on). The amount of local memory required depends upon whether or not a brute force approach is utilized, one bit for every dot or approximately 1.28 bytes for an 8½- by 11-in. page, or the utilization of sophisticated compression algorithms that may require only 30K to 50K bytes per page. Necessary processing is off-loaded from the host with the concomitant increase in throughput and/or capability and a resultant reduction in the host-printer interaction.

With both types of printers, host preprocessing will be required to support certain printer features or capabilities, such as graphics or the intermixing of text and graphics. This preprocessing is generally performed by special-purpose software resident on the host that must be acquired in order to use certain printer features. Often, the cost of this host-resident software may equal or exceed the cost of the printer itself.

How it works

Before the electrically sensitive unit is charged to represent the print images sent to the printer, the data must be converted to a raster form. Basically, this process involves the decomposition of all print elements into an

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IN DEPTH/SEARCH FOR A PRINTER

ordered sequence of dots. A dot represents the basic unit or building block used in the construction of the print images by the printer-charging mechanism. This is analogous to a pixel in graphics, and often the two terms are interchangeable.

The quality of the final image depends upon the size of the dot produced by the charging mechanism. For example, a typical photocopier printer today can generate 300 dot/in. with each dot occupying approximately 0.003 in. In comparison, the resolution or dot size for dot matrix printers ranges from 0.03 in. to .007 in. Printers are currently available in the marketplace, such as the Canon printer, which can achieve dot sizes of 0.002 in. Resolution of 700 to 800

dot/in. is needed to be considered typesetting quality. Currently under way are attempts to achieve typesetting quality.

Internally, each dot is represented by a single bit or binary digit that is independent of the dot size. Hence, once an image is rasterized, the quality of the final output depends on the printer dot resolution or dot/in. Conceptually, the rasterized image can be used as readily on a 300 dot/in. printer as on a 700 dot/in. printer, although the quality of the end product will be significantly different.

The charging mechanism imparts a charge by switching the beam off and on for all dots on line number one during a left to right scan parallel to the drum axis. Lines two

through six are done in a similar manner and in sequential order. The image becomes obvious once the entire dot pattern is laid down.

For example, in a laser printer, the laser beam scans across the length, generally the drum axis of rotation, of the cylindrical printer drum imparting the necessary charges. The drum then advances forward by a given increment (for example, the dot resolution), and the entire drum length is again scanned and the proper charge applied.

This process of advancing the drum by a given increment and scanning the drum length is repeated until the entire drum is charged or the latest image generated. The charged areas attract the toner, which is then

transferred to paper in a manner similar to a standard photocopier, revealing the latent image. The process is extremely rapid, being accomplished in approximately 1 to 2 msec on the low end and 100 microseconds on the high end.

In a laser printer, scanning of the drum surface is accomplished by reflecting the laser beam off of a rotating polygonal set of mirrors. Each face of the rotating mirrors causes the laser beam to scan the entire drum length. The area per second is equal to the number of mirror faces times the number of revolutions per second of the rotating mirrors. An LED printer accomplishes the scanning process by electrically switching the current to a stationary linear

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Vendor	Representative product(s)	Approximate price	Pages/min
Comma Data Systems, Inc. 275 E. Hillside Drive Thousand Oaks, Calif. 91320	Comma Laser Printer (L)	\$ 3,395	8
Cynthia Perichamps Corp. 708 Saratoga Ave. Berkeley, Calif. 94708	Model MP6000 (H)	\$60,000	90
Dalsen/Smith Corp. 6300 Carnegie, P.O. Box 748 Woodland Hills, Calif. 91365	Model MP24 (L)	\$12,495	24
Edaphes Systems 977 Petersen Drive Massachusetts, Ont. Canada L4R 0V6	Model 28000 (H)	\$35,000	80
General Business Technology 1891 McGraw Ave. Irvine, Calif. 92714	Model 8800CP (L) Model 8820CP (L) Model 8860 (L)	\$22,500 \$15,000 \$ 8,995	12 12 8
Harvest/Peterson Co. 3000 Haverhill Rd. Palo Alto, Calif. 94304	Model 2807 (L) Model 2888A (L) Model 2888 (L)	\$12,800 \$28,950 \$ 3,495	12 12 8
11000 Wells Rd. Cupertino, Calif. 95014			
IBM Information Systems Group 800 Ring Rd. Rye Brook, N.Y. 10593	Model 2820 (L)	\$28,950	20
Pang Systems Corp. 2800 Liberty Ave., Box 2800 Pittsburgh, Pa. 15220	PLP 10 (L)	\$18,000	10
Royal Business Machines 620 Day Hill Road Wendover, Conn. 06090	Royal 2800 (L) Royal 8800 (L)	\$18,500 \$73,750	20 60
Talenti Systems, Inc. 1840 Westport Ave. P.O. Box 8309 La Jolla, Calif. 92038	Model 800 (L) Model 1202 (L) Model 2400 (L)	\$ 8,890 \$24,950 \$34,950	8 8 24

L - Laser printer
H - Ink jet printer
L - Laser printer
H - High speed printer

Figure 1. Screen printer vendors

IN DEPTH/SEARCH FOR A PRINTER

DTF Page Printer	Cyberbit Systems 12 2000	Dolphin Systems 2000	Peripherals LaserJet 2000	Quality Vision Systems LaserJet 2000	Value Systems 2000
Approximate price	\$80,000	\$20,000 (CDS)		\$0,000	\$20,000
Ports					
Byte type	27	5		300 SPD	300 SPD
Max. data rate (bytes)	48	15		30 SPD	30 SPD
Max/min. data rate	No	No		SPD	SPD
Total I/O	27	2		SPD	SPD
No. channels	16	16 (40)		Yes	Yes
No. in business (1984)	4 (5 max.)	2		12 (+5)	12 (+5)
No. of lines/line	24	2		SPD	SPD
No. of lines/page	24	2		SPD	SPD
Variable width	Yes	Yes		Yes	Yes
Connectors	Yes	Yes		Yes	Yes
Form capacity	Yes(2)	Yes(2)		Yes(2)	Yes(2)
Text features					
Text processing	No	No		G.T.X	G.T.X
Graphics output	No	No		R	R
Hardware	N/A	N/A		C.A.T.P	C.A.T.P
Operating systems	N/A	N/A		SPD	SPD
Connectors				A.S	A.S
Interface	No	1 (2)		C.T.V.	C.T.V.
Processor	6.2M	6.2 (+5)		R.P.A. (+5)	R.P.A. (+5)
Local memory	16 (20K)	16-1		MC68000	MC68000
RAM (data, image)	12K bytes	384 bytes		2M bytes	2M bytes
RAM (image)	32K bytes	64K bytes		384 bytes	384 bytes
RAM (program)	No	1M byte (+5)		Yes	Yes
Job output number	Yes	Yes(2)		No	Yes
Page output					
Page/line	90	60		6	24
Page/line (print)	10 to 1,200	1M to 1,200		6,000	6,000
Line, page/line left	10M	1M		N/A	50,000
Print engine	N/A	AQ400		LSP-CX	XP4000
Resolution (dot/in.)	240	240		300	300

Figure 2. This small sample of nondrop printers illustrates the range in print engines and prices.

array of diodes. On the other hand, magnetic printers employ a row of perpendicular recording heads to magnetize areas of the drum surface, thereby stimulating the laser scanning process.

Pros, cons

Among the advantages of the electronic page printers, as compared with the more conventional mechanical printers, are high print speed, high performance/price ratio, the ability to change typefaces automatically, graphics capability and typesetting. They offer a wide selection of fonts; handle forms, logos and electronic signatures; can intermix text and graphics; operate quietly (generally less than 55 dba); and produce high-quality output (at high resolutions). The disadvantages include the limit to the number of pages per month of output (product dependent), a potential increase in maintenance costs and reliability comparable to regular photocopiers.

Responsible suppliers can be identified by referencing periodicals indexes such as the *Science and Technology Index*. For disciplines in which rapid technological advancements occur, it becomes necessary to survey the marketplace frequently. It is predicted that there will be at least 60 different print engines by the end of 1985.

My survey of the marketplace performed in November 1984 turned up a total of 23 vendors of low-end, nondrop printers (five to 20 page/line). The vendor list is shown in Figure 1. IBM, which introduced its 3800 laser printer this past February, has been added to the list. Suppliers of magnetic and ink printers are included in the list, regardless of print speed, because they represent newly emerging technologies of which the reader should be aware. In the LED area, Seay Business Sys-

tems Corp. of Moonachie, N.J., is reportedly developing a printer to be priced at approximately \$5,100 that will output 30 page/line.

Some of these printers are achieving speeds approaching those of laser printers that cost five to 10 times more. For example, the Dolphin Systems 80000 ton printer prints 60

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Hardware and operating system dependencies soon arise once the user attempts to take advantage of some features such as graphics or multiple page fonts.

page/min and is available to OEMs at a cost of approximately \$26,000. Xerox Corp. recently acquired 50% of Dolphin Systems. For the most part, the vendors listed here supply the necessary hardware or software interfaces to enable utilization of the printers and do not actually manufacture the print engines.

Following is a list of the basic print engine manufacturers: Cyberbit Peripheral Corp., Dolphin, Honeywell, Inc., IBM, Upstart and Xerox.

In West Germany, there is Siemens Corp. In Japan, the manufacturers include Canon, Fujitsu Ltd., Hitachi Ltd., Minolta, Panasonic Co., Ricoh and Toshiba, Ltd. The companies who develop the interfaces or controllers for the print engines include Dataproducts Corp., Electronic Machines Corp., Imaging Corp., Personal Computer Products,

Inc. and Rasterization, Inc. Some companies that integrate the controllers with the print engines are Imaging, Quality Micro Systems, Inc. and Office Automation Systems, Inc.

Vendors often give different names to different features. Comparing printers therefore requires distinguishing which features are the same. One such term is "proportional spacing," which is also expressed as "variable width fonts."

Some printers can digitize a document locally for transmission back to and storage on the host computer by scanning a document placed on the glass window. This feature is extremely handy in creating new fonts for logos or electronic signatures and, as an on, but its ultimate use is left to the user's imagination. Generally, for a printer that does not support this feature, a separate unit can be purchased and interfaced to it.

A local copy capability is an integral part of some printers, enabling them to be used as a standard copier. Another attractive feature is the ability to distinguish between the output of several different tasks. Job separation is beneficial in a multi-task environment.

Job separation is accomplished by an offset stacker or an output stacker or collator. An offset stacker separates each job's output by shifting the output a few inches left or right, while the output stacker separates material by utilizing separate distinct bins. For printers without this capability, job separation can be accomplished by the software through the use of a title page separator.

These printers typically can accommodate standard and legal paper sizes, ranging in weight from 16 to 24 lb. Some can also handle other paper sizes such as European, ledger, fanfold and the A and B series sizes. Multiple input trays of varying ca-

capacity may be provided as optional or standard equipment. They permit convenient use of several paper sizes or may simply increase the machine's input tray capacity. Selection of a given input paper tray on some printers can be performed under software program control.

Another desirable feature, provided via a manual-feed capability, is the ability to handle nonstandard paper types, such as envelopes, transparencies, post cards, business cards and labels.

For the most part, the printers can be interfaced to any hardware, provided that the proper interface is available — for example, an RS-232 or a Contradict Data Computer Corp. parallel interface. However, the existence of these interfaces only permits the printer to be used in a manner analogous to a conventional printer.

Points to watch

Hardware and operating system dependencies soon arise once the user attempts to use some printer features such as graphics or multiple page fonts. At this point, software, which is necessary in order to utilize these features, enters the picture with its accompanying hardware and operating system dependencies. The availability of software to drive these printers becomes a critical issue. Without it, some printer

IN DEPTH/SEARCH FOR A PRINTER

features cannot be used.

Another item that needs to be clarified is printer resolution. Even though a printer may be capable of achieving a resolution of 300 dot/in., it may not be capable of maintaining that resolution for an entire page of output. This deficiency generally results from the lack of local memory to bit-map an entire page, say 8½ by 11 inches.

For example, the Hewlett-Packard Co. LaserJet 2000A has only 60K bytes of local random-access memory, which when used for full-page graphics can only achieve resolutions of 75 dot/in.

In Figure 2 (on D/6), optional printer features explicitly identified by the vendor are labeled as such. However, for the sake of brevity, price is not listed. The price specified for the printers does not include

discounts or any optional features. In order to use all of the printer features, such as a graphics capability, software must be acquired from the printer vendor or a third-party software firm (see Figure 3).

The cost of the software can add substantially to the cost of the printer. Depending on the application, the cost may exceed the printer price.

Some print engines have a limited life with respect to the number of output pages, after which the entire print engine must be replaced. Since several different levels of maintenance may be available, it is important that the buyer be aware of what parts are covered within a maintenance agreement.

Printers are generally offered as a complete package, except sometimes, for additional fonts or special interfaces. For example, in order to sup-

port a user's graphics requirements, it may be necessary to purchase an optional controller or additional host software.

Certain printer features may not have the software to support them right now. For example, a printer with the capability to perform graphics or intermix text and graphics on a page of output may not have the required software for the given environment (for example, Gould, Inc.'s Concept 32/6700 running Unix BSD 4.2).

In the course of reaching a purchase decision, trade-offs and compromises inevitably occur.

About the author

Vincent Cervo is a programmer/analyst for the State University of New York College of Technology in Utica.

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Figure 3. Some software products and vendors



Building Logical Data Models

A practitioner's guide

By Thomas Johnston

Historically, the concern of the software developer has been to develop good algorithmic structures. But as nonprocedural languages become more powerful and pervasive, the software developer's work load will shift from designing and building algorithmic structures to designing and building data structures. Information engineering is an evolving set of guidelines for doing that, and the development of good logical data models is one of the most important goals of information engineering.

This practitioner's guide to the development of logical data models assumes a basic theoretical knowledge of data normalization, in particular, a familiarity with the first three normal forms and the use of foreign keys to implement them in a relational framework.

A logical data model, specifically, is:

- A data dictionary of well-defined and well-named data elements, containing no homonyms or synonyms. Each data element means one thing, and no two data elements mean the same thing.
- A set of data groups in third normal form, with relationships implemented by propagating primary



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also contained in a subset of an accounts receivable system and some of the data elements in those master files. The numbers on the left make it possible to track intermediate and final products back to the original source system data elements and data groups; they are an audit trail.

Potential problems: The entire data base design effort can be derailed at the outset if the analyst does not begin with a thoroughly small set of views. Vendors of data base design aids such as Data Design or advocate development of logical data models by synthesizing user views. Each view is normalized, bubble-charted and entered into the computer; the design aid then synthesizes the views into a preliminary data model.

What is wrong with this approach is that until the analyst has a thor-

ough understanding of the meaning of each data element, his bubble charts will not be accurate. The kinds of mistakes made in initial bubble charts of views are the following:

• Foreign key occurrences may not be identified initially, because the same data element will have quite different names on different reports. It takes considerable knowledge of the application and the subject area before these synonyms are seen to be different names for a single data element. Consequently, in initial bubble charts, synonyms may abound; this means that foreign key relationships may be overlooked.

• Spurious data groups may be created initially. Often, the analyst makes mistakes in bubble-charting reports that combine detail lines following a header group. He will chart

detail lines as single data groups and assume that their key is among the data elements further to the left on the line. But often, detail lines are assembled from multiple data groups, and elements from the same data groups may appear in both header and detail areas on reports. Finally, primary keys sometimes do appear toward the right on the print-out page.

Step 3 Scrub out the implementation-specific data elements, leaving only those that would be found in any adequate system of its type. This step is necessary when the logical data model is being constructed bottom-up from one or more existing applications. The advantage of bottom-up construction is that the resultant model is less likely to be overly simplistic; the danger of reflecting undesirable idiosyncrasies

of an individual system are minimized by the normalization process itself.

They can be further minimized by starting from two relevant systems and also by combining bottom-up synthesis with top-down documentation of the functional entities of concern — using such methodologies as entity-relationship analysis (Chen) or Business Systems Planning data decomposition (BSA).

Potential problems: Scrubbing the implementation-specific data elements is not as straightforward as it sounds. For example, while it is pretty obvious that batch control totals or internal switches controlling the traversal of main runs should be scrubbed, what should be said about a switch indicating that a general ledger extract has been made? Or a switch preventing the system from running after Report A unless Report B has also been run?

No matter what heuristic rules are developed for scrubbing, it is ultimately going down to semantics and application knowledge — to knowing what data elements mean, what those data elements do and, finally, what the application should do for the end user. However, given that knowledge, this step can be interpreted to mean keeping data elements that fall into one of the following two categories:

• A data element presented to the end user (whether on a screen, a report, a query or the like) that he would reasonably be expected to find helpful in managing a company's receivables (in the case of this accounts receivable example).

• A data element not presented to the end user but that controls a decision that any adequate system of its type would have to make.

In this case, the former would include such obvious data elements as customer number, customer balances and various subtotals and totals on balances. It would exclude batch control totals, transaction error codes and messages and other performance-monitoring data elements not specific to accounts receivable.

The latter would include switches for clearing and rolling totals at period-end, creating the extracts to feed general ledger and sales analysis and an open-item vs. balance-forward customer type code. It would exclude restart and recovery flags and switches controlling the sequence of reports, provided the sequence would not be required of any adequate accounts receivable system.

Step 4 Find the native and foreign key occurrences of primary key data elements and give them the same name as the key data element itself. Name and define the relationships that the foreign key occurrences implement.

Figure 2 shows the results of this step, in which foreign keys have been identified and named. The relationships that have been annotated are those implemented by means of foreign keys that occur as primary attributes. Relationships implemented by foreign keys that occur as primary keys are generally perspicuous and so have not been annotated. (The data dictionary is being populated as data elements are named and defined, but is not shown here.)

Potential problems: Because the different foreign key occurrences of a data element implement different relationships but the name of the data element remains the same,

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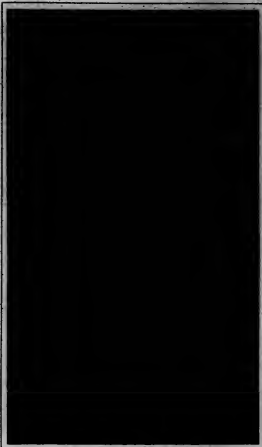


Figure 2. Foreign keys and relationships

those different relationships must be named and defined. For example, ACCT-4D always points back to the Chart of Accounts Data Group, where it is the key. But in one data group, it may represent a corporate entity total of sales tax, while in another it may represent a "bucket" for the amounts on invoice line items.

Until the analyst knows which data elements are going to be primary keys, he cannot identify their foreign key occurrences and name those occurrences correctly. This situation requires him to normalize before he names, so that he will know which data elements are keys.

For example, if he did not know that a certain fiscal date was going to be the primary key for the accounting period data group, he would give different names to its different occurrences (he would create synonyms). The relationship of the accounting period data group to other data groups would, therefore, fail to be made.

On the other hand, the analyst cannot normalize a mass of data elements that liberally contains both homonyms and synonyms; it is a scrubbed set of data elements that should be normalized. As to synonyms, if a single data element is

called by different names on four different reports, it will appear as four different elements in the data model.

If several of its occurrences are thought to be key data elements, it will lead to the creation of spurious data groups. All occurrences of a single data element must be identified and given the one name assigned to that data element.

As to homonyms, no homonym can be fully functionally dependent on any primary key, unless by accident the two (or more) semantically distinct elements it represents both happen to be dependent on the same key. The two or more data elements it combines should be separately defined and named and each put into its appropriate data group.

The solution to this chicken-or-egg problem is, unremarkably enough, that neither naming nor normalizing comes first. But rather than trying to name everything all at once, the analyst should concentrate on the structural elements, that is, the keys that distinguish data groups from one another and that, as foreign keys and intersection data group keys, relate data groups to one another.

Step 6: Name and define all remaining (auxiliary) data elements. Put each in the data group that has

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Figure 3. Schemata of the logical data model

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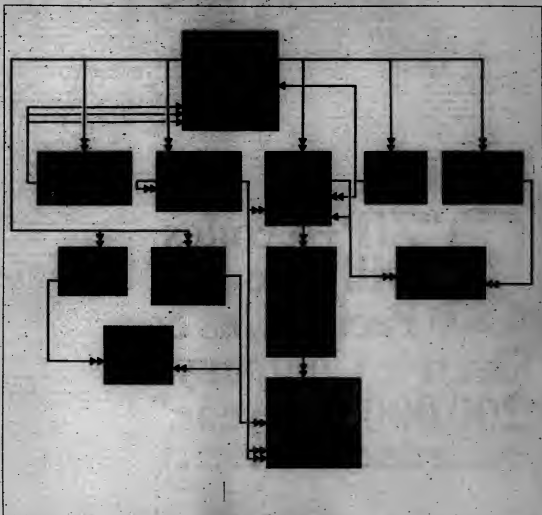


Figure 4. Logical data model diagram

the primary key upon which it is fully functionally dependent. Create new data groups whose necessary to ensure that all data groups in the logical data model are in third normal form.

The next task is to assign each nonkey data element to the data group whose primary key it is fully functionally dependent upon, creating new data groups where necessary to preserve third normal form. This step is almost as straightforward as textbooks make it seem. Assuming that the rules defining the first three normal forms are understood, what is needed to make this step work is simply a set of data elements whose definitions are understood by the analyst. Figure 3 shows the results of this step — a complete set of logical schemata for the subject area being normalized.

Potential problems: Most of the homonyms and synonyms should have been weeded out by this point, but a few may remain. Remaining homonyms are likely to appear as

data elements that seem to belong in more than one data group. If this situation cannot be resolved, then there are two meaning units ("morphemes," to linguists) combined under one name, which should be split apart and named separately. If this is done correctly, each should then go easily into its appropriate data group.

Remaining synonyms are likely to manifest themselves as foreign key relationships that should be there but are not. The reason the relationships are not there is that a foreign key occurrence has been given a separate name and listed as a nonkey data element.

In an earlier version of this logical data model, for example, there was no Accounting Period Data Group; each occurrence of the data element ACCT-PER-ID was given a separate name. Then it was realized that a fiscal date was needed for a report of customer sales totals. This led to the creation of the Accounting Period Data Group, in which fiscal dates

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were paired with accounting periods. Each separately named occurrence of an accounting period in the other data groups was then replaced by ACCT-PRD-ID, thus documenting the foreign key relationship by which the correlation with fiscal data was established.

Step 6: Freeze the logical data model against the significant user views. These include transaction records, batch-control records, error reports, other modified listings, intermediate files, formatted reports, file extracts for interfacing to general ledger, screen displays, query listings and so on.

Steps 1 through 6 create a provisional logical data model. In building it, the analyst dispenses his application knowledge and his knowledge of the semantics of the data elements and groups. He avoids trying to nor-

melize a mass of user views before he has this essential knowledge.

With this provisional logical data model, he can then take one significant user view at a time — reports, input transactions, data entry, update or inquiry screens — and normalize these views, recording them as bubble charts.

If he cannot accommodate the views without creating new keys, then he adds the corresponding data group to the logical data model. Otherwise, he simply adds any new data elements to the data groups indicated in the bubble charts and already present in the logical data model.

Potential problems: Reports raise the issue of derived data elements, for they normally contain several levels of totals, and the question is whether or not to include them in the logical data model. The answer is to

do so if and only if convenient; if the user does not need to see the derived data element anywhere except on the report, then there is no need to store it.

However, that total may be a periodic snapshot of a summation. The report may be run weekly, but better control might be achievable if the total was updated and presented daily or even updated continuously and presented on demand. In such cases, the total should be stored as a data element.

Figure 4 on ID/16 shows a modified Bachman schematic of the final model. All M-M relationships have been resolved into 1:M relationships with intersection data groups. Where two or more semantically distinct relationships exist between the same two data groups, separate arrows have been shown for each relation-

ship. Again, it should be emphasized that this does not represent a complete account of the data system but only selected data elements and data groups from such a system.

Final product

As to methodology, sole reliance on bottom-up synthesis of user views will not readily produce a good logical data model. There is more than an analogy with a view of the scientific method that was prevalent several decades ago: that science proceeds by inductive generalization from observable matters of fact.

This view is no longer held by philosophers of science. Many of the astronomical observations on which Galileo based his support of the Copernican theory, for example, were in fact compiled by Tycho Brahe, but interpreted by him to support the Ptolemaic theory. The inductive generalization description ignores the fact that any nontrivial set of facts can support multiple interpretations.

That is the theoretical mistake implicit in pure bottom-up normalization, that is, normalization of user views followed by synthesis into a data model. But there is a practical mistake also — the mistake of getting swamped by too many views. Without expert application knowledge, the analyst needs to select a manageable small set of views, which nonetheless will encompass most of the data to be included in the model.

This approach makes room for a learning curve. The experience of constructing a provisional model will always produce a deeper understanding of the application than passively reading books or manuals or interviewing end users. Once the provisional model has been constructed, books, manuals, end users and user views are all significantly more meaningful.

As for tools, a grease board and a text editor are the best tools for developing logical data models. During the early design stages, changes come fast and furious, and a delay of even an hour is oppressive. Instant responsiveness is more important than any sophistication of tools. Changes can be made to a grease-board model instantly; changes to text editor data can be available on a local printer within minutes.

The model should be developed and proofed on the grease board or text editor until it is stable through several iterations. Only then should an automated design tool, such as Data Designer (Database Design, Inc., Ann Arbor, Mich.), FSL/PBA (Indos, Ann Arbor, Mich.) or Excelerator (Intel Technology Corp., Cambridge, Mass.), be used. The value of the tool is then as an organized repository for a final or near-final logical data model. It will not materially assist, and may actually hinder, the process of developing the model.

About the author

Thomas Johnston is a data base consultant with Robert Group, Inc., Atlanta, Ga., which provides information systems planning, analysis, design and development services to federal agencies. RGI is currently working on the specification of a Continental Army management information system for the U.S. Army Forces Command.

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MICROCOMPUTERS

Rx: Computing power Hospital goes multiuser route for DP needs

By Kathleen Sullivan
OF West Coast Bureau

COUPEVILLE, Wash. — Whidbey General Hospital, a rural hospital located on Whidbey Island, which hugs the northern Washington coastline, had once cast its eyes longingly on mainframe-based information systems. "But we didn't have the resources to purchase a mainframe, so that was out of the ballpark for us," said Robert Maxwell, the hospital's computer.

Dr. Whidbey General decided to take a different route to meet its data processing needs. About a year ago, the hospital installed a multiuser microcomputer system, the Personal Mini 16 (PM16), developed by Television Systems, Inc., and bought a custom-designed medical management software package offered by a Washington-based software house.

Now the 50-bed hospital has the computing power that would normally be found in a facility four times its size, Maxwell said. "Most U.S. hospitals that have

data processing capabilities are much larger than Whidbey General's," Maxwell said. "Usually, you must have 200 beds just to be able to afford an order entry system and financial resources five to 10 times as big as ours."

Maxwell estimated that the hospital spent about \$150,000 on the system, including research and development costs, a figure he said represented one-tenth the outlay for an equivalent mainframe system.

Maxwell, like two other PM16 users interviewed by *Computerworld*, gave Television high marks for its system. Attracted to the PM16 because of its architecture and low cost, all three users said they had found the system to be reliable.

Harli Mett, an in-house computer consultant at the Moline, Ill.-based John Deere Co. headquarters, said the system's network software, designed by Utah-based Novell, Inc., was the driving force in the See TELEVISION page 60

Turbo Pascal micro tool gets enhancement

BOOTHE VALLEY, Calif. — Borland International has enhanced Turbo Pascal, a Pascal applications development environment that runs on a number of microcomputers.

The enhanced program reportedly compiles and executes programs at twice the speed of previous versions. Other enhancements include a memory-mapped editor and a feature that allows a user to develop graphics programs, the vendor said.

The enhanced package also is said to allow users to build their own applications library subroutines and offers optional support for Binary Coded Decimals.

Turbo Pascal consists of a compiler, an editor and a debug spreadsheet. It runs on micros with IBM's PC-DOS, Microsoft Corp.'s MS-DOS and Digital Research, Inc.'s CP/M-80 and CP/M-86 operating systems. See PASCAL page 62

■ Ryan-McFarland has introduced a version of its RM/Cobol for IBM's PC/XT operating system/60

■ Front Row Systems announced software that creates customized menus for Lotus Development's 1-2-3 package/60

■ Enriksen unveils a memory board that can boost the IBM Personal Computer AT's internal memory to 3M bytes/64

Software/68

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AGS unveils software

KING OF PRUSSIA, Pa. — A systems management package designed to guide managers in the development and maintenance of software systems has been introduced by AGS Management Systems, Inc. for the IBM Personal Computer.

Called Computer-Aided Methodology, the software reportedly includes development guidelines, systems management guidelines, an automated priority ranking system, automated estimating systems and an automated project planning and management system.

In the initial phase of the project's development, users are guided through the reviewing and prioritizing of service requests, AGS said. Next, the software is said to permit planning and estimation of the extent of the work involved in the project. In the work scheduling phase, the system assists in the planning, organizing and scheduling, reviewing and managing of the project. In the work management phase, the software reportedly offers the tools to measure project status and performance.

The software comes with two references and is priced at \$22,950 for a single-user license. It requires at least 512K bytes of internal memory.

AGS Management Systems is located at 880 First Ave., King of Prussia, Pa. 19406.



A month for foolery

Almost every day seemed like April Fools' Day last month.

IBM drops the ax on the PCjr. The revamped PCjr is a good little machine, and it was the best-selling micro during the 1984 holiday season. But earlier this year after IBM boosted prices, sales softened, and it was time for a little blue printing.

And once again, the industry is waiting for the next IBM move, although the giant vendor is now trying to avoid surprising itself. Among its current concerns is the PC Network, scheduled to ship by today, which will not necessarily achieve a stunning success. ("What do you mean, rewrite the entire building just for this?")

See PCJRS page 62

IBM SQL/DS and DB2 relational DBMS now on PC

ORACLE, the relational DBMS compatible with IBM's SQL/DS and DB2, is now available on the IBM PC/XT and PC/AT. While SQL/DS and DB2 run only on IBM mainframes, ORACLE runs on IBM mainframes as well as on DEC, DG, HP and most other minis and micros. Any application written for SQL/DS or DB2 will run without modification on the complete range of systems supporting ORACLE, including PCs. SQL/DS and DB2 are relational database management systems; ORACLE is a relational DBMS plus an integrated set of 4th generation software tools for application generation, report writing, color graphics and network communications.

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tion of DB2 and SQL/DS applications. The flexibility of the personal computing environment is made available to programmers creating applications for use with IBM's relational database products.

2. The ORACLE Personal Information Center extends the Information Center concept to the Personal Computer. ORACLE's application generator, graphics, spreadsheet and other end-user tools provide a SQL/DS and DB2 compatible Information Center on the desktop.

Users can become acquainted with the facilities and power of the Information Center in the personal computing environment, and transfer their knowledge and skills as the MIS Information Center facility evolves. The ORACLE Personal Information Center provides the facilities for IBM to develop the cooperative relationship with end users so vital to the success of the Information Center.

In addition, with ORACLE on departmental superminis, users can create identical Information Centers at the department level.

3. The ORACLE Distributed Information Center provides an intelligent set of communication links among multiple systems, with ORACLE running on IBM mainframes and various minis and PCs.

Using ORACLE's SQL/DS LINK networking facility, ORACLE on such diverse systems as MVS, VM/CMS, VAX/VMS, UNIX and PC/DOS can selectively exchange database information using the full capabilities of the SQL language. Applications portable across all environments, can be run identically on any system, and data can be intelligently extracted for use at any site.

ORACLE is currently installed on over 1000 supermini and mainframe systems around the world, as well as on thousands of PCs and compatibles. Oracle's customers include 6 out of the 10 largest U.S. corporations, as well as major foreign companies and many government agencies.

For further information, contact Oracle Corp., Dept. C, 2710 Sand Hill Rd., Menlo Park, CA 94025, at call 415/354-7330 ext. 204.

MICROCOMPUTERS

IBM PC/IX gets RM/Cobol

ROLLING HILLS ESTATES, Calif. — Ryan-McFarland Corp. (RM) has introduced a version of its RM/Cobol language for IBM's PC/IX operating systems, which is based on AT&T's Unix System III.

Software developed under IX RM/Cobol reportedly can run on single-user systems under IBM's PC-DOS and on the Personal Computer AT under Microsoft Corp.'s Xenix, on IBM's Series I under Unix, on IBM's System 9000 under Xenix and on IBM's S/36, 3080, 3090 and 3090 series machines and the 4380 series mainframes under VM/CMS.

IX RM/Cobol gives PC/IX users access to more than 2,000 RM/Cobol-based programs, the vendor said. IX

RM/Cobol features, said to be the same as those of RM's standard RM/Cobol language, include relative and index file access methods at Level 3, the highest level of Asat's multilevel standard.

The latest version of the language's compiler is also included, RM said.

IX RM/Cobol is also said to offer multithreaded input files with alternate and duplicate keys and a portable applications code.

A full IX RM/Cobol system is priced at \$750; runtime packages are priced at \$230.

RM is located at 600 Deep Valley Drive, Rolling Hills Estates, Calif. 90274.

Data base and applications tool out for IBM Personal Computers

BILLERICA, Mass. — Data Language Corp. has announced that its fourth-generation data base and applications development system now runs on the IBM Personal Computer XT, Personal Computer AT and compatible microcomputers.

According to a company spokesman, the Progress applications developer, which also runs on multitier AT&T Unix systems, is insulated from the underlying operating system.

Data base structures can be changed without dumping or reloading data, the spokesman said. Progress includes a recovery fea-

ture that permits an automatic back out of unsuccessful transactions after a system failure.

When a Progress procedure is moved from Microsoft Corp.'s MS-DOS to Unix, multitier capabilities are automatically involved, the vendor said.

The Progress data base and applications development system for the IBM Personal Computer AT, Personal Computer XT and compatibles are priced at \$995 for single-user systems.

Data Language is headquartered at 4 Rindover Road, Billerica, Mass. 01821.

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Realia COBOL is priced at \$995, including one year of maintenance and upgrades. Subsequent maintenance and upgrade contracts are currently priced at \$125/year/copy. Available for the IBM PC, PC XT, 3270 PC, PC AT, PC-compatibles, and the TANDY 2000.

Realia COBOL. What a relief.

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Menu software for 1-2-3 bows

ATLANTA — Front Row Systems has announced Menu Maker software, said to permit the creation of customized menus for use with Lotus Development Corp.'s 1-2-3 software. It runs on the IBM Personal Computer line, including the Personal Computer AT, with color or monochrome screens.

Menu Maker reportedly allows users to replace the 1-2-3 menu with a menu of their own creation. The customized menus and worksheets enable users to develop complete systems in 1-2-3 and serve as a reference to aid in learning the 1-2-3 program.

Menu Maker is said to teach more advanced techniques such as accepting input and performing string manipulation and program iteration. The product reportedly includes a utility worksheet which may be inserted into any current worksheet to reduce the number of keystrokes used in 1-2-3. Menu Maker costs \$40.

Front Row Systems can be reached through P.O. Box 560846, Suite 530, 8 Piedmont Center, Atlanta, Ga. 30356.

Memory board debuts for AT

COSTA MESA, Calif. — Emulex Corp. has introduced its Mega Memory, which provides up to 3M bytes of random-access memory (RAM) for the IBM Personal Computer AT.

The Mega Memory solution to Emulex's Perkyast product line, a full-size printed-circuit board, fits into any of the AT's 16-bit slots. A total of six banks, representing 12 rows, can be populated, using either 64K- or 256K-bit chips.

The board comes with Emulex's Watt-less Printing print spooling software and its Insta-Drive RAM disk emulation software.

Prices range from \$395 for a version without RAM but with sockets for the customer to fill with memory chips to \$6,495 for 3M bytes of RAM. Mega Memory can be reached through P.O. Box 6728, 2646 Harbor Blvd., Costa Mesa, Calif. 92626.



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MICROCOMPUTERS

SOFTWARE

u Clarity Software Corp. has enhanced its 3-3-1 GO software for the IBM Personal Computer line.

The 3-3-1 GO software reportedly converts Lotus Development Corp.'s 3-3-3 and Symphony spreadsheets to the models and data files usable in Executive Systems Corp.'s Interactive Financial Planning System (IFPS).

Release 2.0 of 3-3-1 GO translates all 1-3-3 and Symphony functions with equivalent definitions in IFPS and supports the new features of IFPS/Personal Release 2.0.

The vendor said 3-3-1 GO Release 2.0 is being provided free to current users and priced for new users at a corporate license fee of \$3,300.

Clarity Software, Suite 304, 12575 Research Blvd., Austin, Texas 78750.

u Cambridge Computer Corp. has introduced its FC78/79 software for emulation of Honeywell, Inc. terminals on the IBM Personal Computer line, including the Personal Computer AT.

Under FC78/79, the Personal Computer is said to be able to emulate the Honeywell VIP7200, VIP7300 and VIP7800 series of asynchronous terminals. The software also reportedly uses Intel Corp. 8087 or 80287 math coprocessors, if available, and provides remote and screen printing simultaneously with host inquiries and updates.

The software is priced at \$300.

Cambridge Computer, 151 Bedford Road, Mount Carmel, Conn. 06061.

u H & A Computer Systems, Inc. has introduced an IBM Personal Computer version of its Program Executive System (PES), an integrated applications development environment previously available only on the IBM Series/1 minicomputer.

Using PES, applications for the Series/1 can be downloaded to the Personal Computer and run under IBM's PC-DOS, according to the vendor. Applications development will also be expedited, the vendor added, because users will be able to compile their programs on the Per-

sonal Computer itself.

PES includes a procedural language-based application development language, PXL, that reportedly provides the functionality of the C language with the ease of use of IBM's EPO language. PES' data management capabilities include indexed, linked and direct file organization and unlimited secondary indexing.

Up to four levels of nested menus are said to be supported by the software's integrated menu manager. Data files

developed under PES are protected against accidental errors or damage during an update.

PES and PXL are each priced at \$500.

A screen/report source code generator and a documentation system, said to be similar to a data dictionary, are available as options at \$100 each, according to the vendor.

H & A Computer Systems, Suite 204, 30 Hoteling Place, San Francisco, Calif. 94111.

u ADF Financial Network Services, a division of Automated Data Processing, Inc., has announced enhancement of its Cash Express Version 1.1 software for the IBM Personal Computer and Personal Computer XT.

Cash Express Version 1.1 allows users to isolate specific account groups for analysis and to take advantage of unattended data retrieval and selective system security, a spokesman said.

Version 1.1's Cash Posting Ricing function is said to allow users to view selected account groups according to specified criteria. Other enhancements reportedly allow cash managers to instruct their workstations to retrieve specific data at pre-scheduled times each day and to limit the extent to which individual users can access the software.

The product is priced at \$3,500 for a perpetual license for the IBM Personal

Now, whether you're a VAR, OEM, systems integrator or software house, you can dive into the IBM large account base and take advantage of emerging departmental computing opportunities.

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You can further penetrate IBM accounts by offering your applications to a wider range of departmental users in areas like marketing, finance, engineering and human resources, to name just a few. All the same time, you will be helping them leverage their investment in IBM products and providing information Centers with an outstanding product to help meet end-user needs.

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Productivity aids previously restricted to IBM mainframes, such as FOCUS, RANB II*, MODEL*, STRATAGEM* and DYNALINK*, run on the Canaan 5400 at a fraction of their mainframe cost. And the Canaan 5400 can also serve as a communications gateway to IBM mainframes to retrieve and update corporate data bases.

The industry standard Multibus design allows you to integrate a variety of engineering/graphics displays and peripherals. This makes the Canaan 5400 an ideal system for sophisticated graphics applications such as VLSI design and CAD/CAM.

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MICROCOMPUTERS

Computer and \$4,500 for the Personal Computer XT. *AIP Financial Network Services, 175 Jackson Place, Ann Arbor, Mich. 48106.*

SYSTEMS

I Intertec Data Systems Corp. has introduced its Headstart AT3-386, a personal computer incorporating the Intel Corp. 80386 microprocessor and report-

edly offering compatibility with the IBM Personal Computer.

Headstart AT3-386 can operate either as a single-user stand-alone or as a multi-user system when connected to an Intertec Multilan Storage System, available separately. The Multilan system is said to support up to 385 AT3 workstations.

Use of the Intel 80386 is said to provide the AT3-386 with program execution at least eight times faster than

that available on the Personal Computer. The Intertec system features 160K bytes of internal storage, a 13-in. screen with 80-col. by 25-line format and the capacity to display graphics with 640-by 500-pixel resolution. An optional 514-in. floppy disk unit provides 720K bytes of storage.

The AT3-386 is priced at \$2,495. The disk unit is priced at \$685. The Multilan Storage System units are priced ranging from \$2,495

to \$8,995, the vendor said. *Intertec Data Systems, 2800 Board River Road, Columbia, S.C. 29610.*

W Wang Laboratories, Inc. has introduced its Engineering Support System (ESS), based on its Professional Image Computer (PIC) workstation.

The ESS combines the PIC image-processing workstation with Autodesk, Inc.'s Autocad computer-aided

drafting software package. The PIC workstation reportedly features a desktop scanner that digitizes images from sheets of paper and stores them in raster format. The images can then be combined with other previously digitized images and/or integrated with new text to form entirely new documents.

The Autodesk software reportedly allows engineering professionals to capture, create, modify and combine both raster and vector images and then merge them with integrated text to form documents for specific purposes, such as engineering change orders. Drawings are stored in floating-point vector format, the vendor said.

Options for the ESS include support for Microsoft Corp.'s MS-DOS applications as well as several terminal emulation protocols, including the teletypewriter terminal emulation protocol. The ESS is priced at \$30,810, including the PIC workstation, Autodesk software, a monitor and thermal printer. All software needed for image composition and text integration is reportedly provided with the PIC.

Wang Laboratories, One Industrial Ave., Lowell, Mass. 01851.

Philips Information Systems, Inc. has announced the consolidation of its F8100 personal computer and its Communications Computer in a package called Desk Automation. The F8100's CPU and the Conquest share the system's VDT, keyboard and printer.

Desk Automation reportedly joins applications such as word and data processing, electronic mail, calendar and communications.

The consolidation reportedly allows the Philips F8100 and Conquest to provide voice/data transmission over normal telephone lines, to perform speed dialing and to connect with external data bases.

The product costs \$1,995.

Philips Information Systems, Suite 300, 15301 Dulles Plaza, Dulles, Texas 75248.

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MICROCOMPUTERS

COMMUNICATIONS

■ **Keyword Office Technologies** has announced new document-exchange software modules for its **Keyword 7040** document-interchange system.

Two of the modules, for the IBM Displaywrite 2 text-editing software and IBM's AS/40 administration system, provide links from various incompatible word processors and micro to IBM's Document Content Architecture, a spokesman said.

Other modules reportedly support Wang Laboratories, Inc.'s Office Information Systems SM-4a format, Office Solutions, Inc.'s Office Writer and Leader Business Products, Inc.'s Super No Problem software.

Keyword also announced a capability for all its software to produce ASCII output, allowing documents to

be moved into various environments for electronic mail, print output and interchange to other systems.

The modules cost \$406 for uni-directional pairings between incompatible systems.

Keyword Office Technologies, 2047 Hamilton Ave., San Jose, Calif. 95128.

BOARD-LEVEL DEVICES

■ **Linkdata** has announced a multiterminal enhancement for the IBM Personal Computer that reportedly supports up to nine terminals and a printer at its operating environment.

The Multi-PC/486 incorporates two enhancements to the Personal Computer to adapt it to the multiterminal

environment, according to the vendor. These are an add-in Motorola, Inc. 68000 processor board with up to 512K bytes of memory and an intelligent serial I/O card called Linkdata that reportedly can support four or eight additional RS-232C ports usable for terminals, printers and modems.

The add-in boards work on any standard Personal Computer, Personal Computer XT or Personal Computer AT with 128K bytes of memory and support the company's 25M-, 40M- or 60M-byte disk systems, the vendor said.

Prices for the enhancements are \$2,595 for the Motorola processor, \$875 for a four-port version of Linkdata and \$1,325 for an eight-port version of Linkdata.

Linkdata, 2005 St. 22, Union, N.J. 07083.

See 80689 page 62

TELEVIDEO See page 56

firm's selection of the PM16. He described the Novell network's performance as outstanding.

Mett said Televideo provided an implementation of the Novell network that was "significantly cheaper" than those offered by other firms. "Immediately after the demonstration available to John Deere." The company has installed three PM16s, which are being used by its software development staff and a variety of engineering personnel.

John Deere has connected IBM Personal Computers to its PM16s. But Mett said the company is looking forward to Novell's next version of the network software, which will allow users to hook up IBM Personal Computer ATs to the network.

Unlike Walden General, which relies primarily on customized software, John Deere's staff is using off-the-shelf software on the PM16. At present, the firm is using Micropro International Corp.'s Wordstar, a data base manager designed by Irvine, Calif.-based Daylin, Inc., and Enbase, an integrated software package developed by the Software Group, a Balacon Lake, N.Y., firm.

Mett said the company first bought the PM16 to handle its word processing applications. Currently, its word processing staff is sharing 688K bytes of disk storage and two high-quality, high-speed printers. This ability to share peripherals was one of the attractive features of the system, he said.

Tom Donahue

David Britton, both assistant principal and systems administrator at Pile High School in Tacoma, Wash., evoked the use of its PM16, which was installed last September. According to Britton, the system has performed flawlessly since the start of the school year. "We have not seen downtime on the system," he said.

Pile High School, which has 600 students, is using both custom-designed software and commercial packages on the system, Britton said. Its administrative operations — which include everything from monitoring attendance and producing class schedules to sending out grades — are handled by Schedmaker, a program developed by a Tuvewater, Wash., company.

Before installing the PM16, Pile shared an on-line system with 40 other school districts, a situation that sometimes resulted in competition among the districts for the system's resources — when it came time to issue report cards, for instance. Relying on a third party to produce reports proved frustrating as well, because the school would find itself waiting a couple of days to receive reports it had requested, Britton said.

He said the school was attracted to the PM16 because of its record-keeping capability, a feature the school has found very important.

In addition, Britton praised the system's dynamic disk allocation, which he described as the "ultimate in disk storage." Unlike traditional hard disk systems in which a disk is physically divided into user areas that remain fixed, dynamic allocation is flexible. The system chooses the most efficient way to store the data, he said. As a result, there is "no dead space on the hard disk," he explained.

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SPECIAL REPORT

Micros in Big Business

In the April 29th Computerworld Special Report we'll report on management strategies for integrating micros into corporate information systems; offer users' experiences with micros; discuss the emergence of the Personal Computing Manager; provide overviews of business-related microcomputer hardware, applications software, and systems software; look into security risks; and examine how large MIS/DP organizations are networking their micros.

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COMPUTERWORLD



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MICROCOMPUTERS

BOARD from page 60

Winning Designs has introduced its IQ185 coprocessor expansion board for the IBM Personal Computer line.

The IQ185 reportedly features a full Winchester disk controller, an Intel Corp. iAPX186 processor and the ability to download user-written software programs and drivers into resident random-access memory.

Using its Basic I/O System routine, custom applications reportedly can be designed. Included with the IQ185 are software for speaking to RS-232, serial and parallel interfaces as well as a subset compiler of Digital Equipment Corp. VT100 terminals and a resident iAPX186 debugger.

The IQ185 is priced at \$1,565. *Winning Designs, Suite 206, 7910 Greenwood St., La Jolla, Calif. 92037.*

3M Inc. has introduced 3M-byte and 4M-byte memory expansion option boards for its System 8000 supermicrocomputers.

The boards reportedly increase the System 8000's maximum memory to 8M bytes. They can be used in all models of the System 8000 family, including the Series 1, the Plus Series and the Series 2, according to the company.

The 3M-byte board is priced at \$10,060. The 4M-byte board is priced at \$18,560. *3M, Systems Division, 1315 Dell Ave., Campbell, Calif. 95008.*

Shambler Corp. has introduced its Percept Home Combo and Color Combo combination boards for the IBM Personal Computer line. Both boards are said to offer mul-

tifunction and display capacities on a single board with no use of page-locking and to provide both monochrome and color display. They use gate array technology and offer up to 284K bytes of on-board memory, the vendor said.

Included with the boards are two software programs, Insta-Drive and Wait-Less Printing. Insta-Drive reportedly uses user-assignable random-access memory to emulate the storage capacity of up to four single-sided diskette drives. Wait-Less Printing provides user-defined buffering through automatic spooling.

The Percept Home Combo Card and the Percept Color Combo Card are each priced from \$630 to \$1,145, depending on the amount of on-board memory.

Shambler, 3545 Harbor Blvd., Costa Mesa, Calif. 92626.

FOOLS from page 65

Don Rodriguez leaves Boca Raton, Fla. The head of Intel's IBM Entry Systems Division left to supervise IBM's manufacturing operations. Perhaps IBM wanted someone else in the public eye, but the shift probably was not the normal rotation of IBM executives.

Digital Equipment Corp. still isn't over the Bababow. Three weeks after outbidding inventories for the Bababow personal computer by acknowledging that production was shutting down, DEC handled the high-end machine with office automation software and flung it out into the world again. For now, industry analysts were unanimous — stunned at DEC's refusal to accept the need for IBM compatibility.

None of that. Jan. Lotus Development Corp., which has ragged unmercifully on other software vendors for late deliveries, was forced to delay shipment of its Jan integrated package for Apple Computer, Inc.'s Macintosh. The package is "buggy as a swamp," one Lotus insider said, and it kept crashing during public previews.

This is not the first time Lotus was late, however, although the company dodged the bullet the first time around. In April 1983, Mitch Kapor presented a second version of 1-2-3 by year end. If this package didn't evolve into Symphony (which shipped in July 1984 and thus would be six months late), it hasn't appeared at all.

People started throwing around software price numbers as if they meant something. A Future Computing, Inc. study found that half the business software packages in use are underpriced, and that figure is now quoted everywhere. But those results don't get much respect in the software industry. One marketing vice-president remarked that "you or I could pull just as good numbers from the air."

Then there were the minor curiosities — such as AT&T and Compaq Computer Corp. once again making conflicting product announcements during the same week in New York, or Burroughs Corp. ducking into office automation half a decade behind everyone else.

It has all been very entertaining, and there may be other good news lurking behind all of this — that the customer choices in personal computing are not quite as predictable as they seemed a month ago.

PASCAL from page 55

tune and requires 36K bytes of random-access memory.

Turbo Pascal sells for \$69.95; options that support an Intel Corp. 8087 math coprocessor or a Binary Coded Decimals each cost \$29.95.

Borland International is located at 4113 Santa Valley Drive, Santa Valley, Calif. 95066.



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COMMUNICATIONS

AT&T touts Accunet, DMI interface

By John Hie
CHI Star

ORLANDO, Fla. — An AT&T Communications spokesman recently outlined how its Accunet digital network service works with AT&T Information Systems' Digital Multiplexed Interface (DMI), an interface AT&T is promoting as a standard.

Spending before about 100 representatives of 30 manufacturers that have pledged support or interest in DMI, Dave Ferguson, district manager of AT&T Communications custom services planning, explained how DMI and Accunet services now work together and detailed plans for future capabilities.

DMI is a signaling format that specifies how 1.544-Mbit/sec T1 digital transmission facilities are split into individual chan-

nels. It calls for the bandwidth to be divided into 24 64K bit/sec channels and for the use of common-channel signaling. With this signaling method, information about each channel is sent on 23 of the channels — such as whether they are on- or off-line — is combined in the 24th channel, Ferguson explained.

Although use of one channel is lost with common-channel signaling, the remaining 23 channels can operate at full 64K bit/sec rates because they are not encumbered by signaling data. By comparison, bit-robbing signaling techniques — as well as the Computer-to-Private Branch Exchange interface developed by Digital Equipment Corp. and Northern Telecom, Inc. — require one bit in every byte to be used for signaling, which lowers obtainable chan-

nel speeds to 56K bit/sec.

Ferguson said customers can use AT&T Communications' Accunet T1.5 service today to interconnect PBXs and computers equipped with DMI interfaces on a point-to-point basis. In this application, the Accunet service is essentially a 1.544-Mbit/sec pipe. There is one caveat: Although the service provides a clear channel over which customers can pass any type of digital information — data, voice or video — the traffic must contain a certain number of binary 1s to meet a 1s density requirement.

"Out of every 8 bits you send, you have to send at least one [1]," Ferguson said. "When you send a zero, there is no signal, and if you don't send a signal for a long

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■ Telematics International has introduced a network control software package designed for the company's Net 25 line of packet switches/64

■ DEC has announced Scholer, a synchronous/asynchronous 2.4K bit/sec modem that is said to be AT&T compatible and adhere to international standards/64

■ Network Systems has announced that its Hyperbus local-area network product line can now be installed with the standard IBM cabling system/66

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DATA STREAM
Paul Kocornicki
CHI Star

Hype obscures issues

During a session titled "Office Automation Roundtable" at the recent Interface '85 communications conference in Atlanta, an attendee asked panellists if a software package existed that could easily notify users about a problem on a network and help a network manager locate the problem. With puzzled looks on their faces, three well-known consultants passed on the question.

This scenario illustrates some of the problems communications managers may face today. Consultants, research firms and the trade press love to talk about tomorrow, but their talks centers on pie-in-the-sky topics like voice/data integration, networking models and local-area networks that support everything. Everyone is eager to sport off about such topics, but the rhetoric's significance in real-world problems is questionable.

"A consultant will come in, examine your operation and say, 'You need a [voice/data private branch exchange, two satellites

See **PROBLEM** page 67

Fiber net use increases Canadian phone companies convert

By Brian Bensen
Special to CWI

Cherished for years as the transmission medium of the future, fiber-optic networks are now beginning to appear in force. This month in Canada, for example, Belltel, the provincial telephone company of Saskatchewan, will inaugurate its recently completed 666 million broadband network, a 2,265-km, fiber-optic, long-distance telephone network serving 63 communities across Saskatchewan.

At approximately the same time, CNCP Telecommunications will begin installing its first fiber-optic network, a 630-mile, 720-km system that will serve the Toronto-to-Montreal corridor. And Bell Canada reports that work is proceeding ahead of schedule on its plan to convert all copper-based, short-haul telephone networks within its jurisdiction to fiber optics by the end of the century. Through the end of 1984, Bell Canada had installed more than 20,000 km of fiber-optic cable in this network. The company plans to install double that amount of cable by the end of 1986.

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Benson is the assistant editor of Computer World Canada, the Montclair, Ont.-based sister publication of Computerworld.

Lightnet links eastern U.S.

NEW HAVEN, Conn. — Lightnet, Inc. has begun construction of the second portion of its planned 5,000-mile fiber-optic network, which ultimately is designed to link 43 cities in 24 states east of the Mississippi River. The network, a 1,677-mile route, will pass from Washington, D.C., through New York to Chicago. A 455-mile route through Florida is also operational.

The company plans to install a fiber-optic cable from New York to Princeton, N.J. Four planned routes, centering in Atlanta, will pass through Washington, D.C.; Jacksonville, Fla.; New Orleans; Chicago; and Detroit.

US Telecom, Inc. has signed contracts with Lightnet and will be a primary contractor for the system as well as a customer.

Lightnet is located at 800 Chapel St., New Haven, Conn. 06506.

Bridge Communications unveils gateway for broadband networks

ATLANTA — Bridge Communications, Inc. has announced Gateway Server/6 (GS/6), which allows the interconnection of multiple Ethernet local-area networks over CATV-based broadband networks.

A company spokesman said GS/6 is an interconnect router that permits communications among up to 256 Ethernet networks over a single 6-MHz broadband channel. Communications over the CATV channel is at a signaling rate of up to 52M bit/sec, using a carrier-sense multiple access mechanism.

Reportedly, the GS/6 uses a mid- or high-optic, single-cable system, which can be accommodated on spare channels of an existing cable plant, including those from broadband network suppliers such as Ungerleider-Bass, Inc. and Sytek, Inc. The unit uses standard CATV-based broadband components such as frequency

translators, the vendor said.

The GS/6 features a modular architecture that includes an Ethernet controller card, a Motorola, Inc. 68000-based CPU card executing Xerox Corp. XMS high-level protocols and a High-Level Data Link Control controller card, the company spokesman said.

The GS/6 filters network traffic so messages are sent only to their intended addresses. Ongoing monitoring of the Ethernet/broadband interface is provided by the GS/6, which has a Network Management Facility for traffic statistics, line-error monitoring and remote loop-back diagnostics.

The GS/6 is priced at \$10,600, plus a \$150 annual license fee for routing software.

Bridge Communications is located at 1345 Shorebird Way, Mountain View, Calif. 94043.

Western Union offers discount

UPPER SADDLE RIVER, N.J. — Western Union Corp. announced recently that users of its Baylink and Telex services can obtain discounts of up to \$1,000 per month on its long-distance telephone service.

Business customers will be able to apply 50% of their Baylink bills and/or usage charges for Telex — including Worldwide Telex — as credit to their monthly long-distance telephone charges, the company reported.

The joint-service discount cannot exceed the actual long-distance bill and is applied to the following month's charges. It will reportedly increase customers' savings over AT&T services more than the 25% average presently possible.

More information on the service is available from Western Union at One Lake St., Upper Saddle River, N.J. 07468.

COMMUNICATIONS

VOICE/DATA
COMMUNICATIONS

■ **Racal-Nilgo, Inc.** has added the Communications Management Series (CMS) Matrix Switch, which it purchases from Syntex, to its line of network management and diagnostic control systems.

The switch is said to provide system redundancy for major network data communications and terminal equip-

ment. Reportedly, in the event that any device fails, the CMS Matrix Switch can restore the network to full operating capacity in seconds by reallocating port assignments from the failed unit to its designated backup.

In its basic configuration, CMS Matrix Switch consists of mainframe units and interface port cards controlled by a single terminal.

Prices for CMS Matrix Switch, scheduled for delivery in April, start at \$40,000.

Add-on components are priced separately.

Racal Nilgo is located at 8600 N.W. 41st St., Miami, Fla. 33166.

■ **GTE Communications Systems Corp.** has announced that its GTE Onal PAKX (private automatic branch exchange) has been certified as an L-35 Inter-System for use on GTE Teletest. Corp.'s packet-switching public

data network.

The Onal PAKX is one of 165 L-35 interface products from 110 vendors that have been certified by GTE Teletest. The line is equipped with a dual-bus architecture that permits simultaneous communication over twisted-pair wires. The line is designed for companies with 30 to 1,800 employees.

GTE Communications Systems is located at 8500 W. Utopia Road, Phoenix, Ariz. 85027.

■ **Telemetric International, Inc.** has introduced Net 25 Interactive Network Protocol (INIP), a network control software package designed for the company's Net 25 line of packet switches.

The package is designed to support a network with one or more network control centers. Network routing tables, network configuration files and software modules are created at the network control center and downloaded to network nodes, the vendor said.

INIP's traffic-monitoring facilities provide a central collection point for statistics, alarms and call accounting information. Statistics collected at frames and packet levels are logged to disk for report generation. At the operator's console, real-time data can be displayed. Up to 255 types of alarms can be defined and each one is assigned an alarm group and severity level.

The product's security features include a 16-character user identification code, illegal entry reports and restriction of user access to various capabilities.

Net 25 INIP costs \$15,000. Telemetric International is located at 1415 N.W. 62nd St., Fort Lauderdale, Fla. 33309.

MULTIPLEXERS/
MODEMS

■ **Digital Equipment Corp.** has announced Scholar, a synchronous/asynchronous 2.4K bit/sec modem that is said to be IBM compatible and to adhere to international standards.

Scholar is said to feature Bell 103, Bell 212A and CCITT V.22 compatibility as well as the international CCITT V.22 BIS standard at 2.4K bit/sec.

The modem can be connected to any workstation via an RS-232C port.

Scholar is priced at \$895 and will be available in May. **DSC, 146 Main St., Hayward, Mass. 01754.**

■ **Datagram Corp.** has announced the Streamer data compressor and statistical multiplexer, featuring the company's own compression algorithm.

A spokesman said Streamer's algorithm is intended to analyze incoming data streams on a port-by-port basis and on a directional basis. Compression ratios average 2.2:1 and 3.2:1.

Streamer is said to be able to compress and/or decompress 5,000 char./sec. The statistical multiplexer routine accommodates data from up to eight asynchronous input channels at speeds up to 9.6K bit/sec. Output data is transmitted in compressed

Continued on page 86

"EMBODY OF HIS 2400bps MODERN, WE'VE GOT TO FIND SOMEONE WHO CAN DELIVER THE MODERN WE NEED"

"THIS CALLS FOR CONCORD DATA."

A. Jones, *Florida Agency Delivering His Speech in the House of Burgesses, Choosing The Business Address*

There's no argument that in today's business arena, 2400bps full duplex dial modems provide the lowest cost and fastest route to data communications. But of all the modern manufacturers that are promising you great dial line savings, there's only one company delivering the modern products you really need—Concord Data.

We offer the largest family of 2400bps modem products on the market, with features that you can mix and match to get just the data performance your business application requires. Choose from autodialing, error correction, statistical multiplexing, complex diagnostics and more. We even have the world's first central site, rack-mounted modem bank that operates at 2400, 1200, and 300bps. We've installed over 50,000 modems worldwide, and we're shipping thousands more each month. And naturally, we're offering revolutionary prices on our complete line. If you've heard enough talk about 2400bps dial line modems, and are ready for action, call us at (617) 890-1394 or write 303 Bear Hill Road, Waltham, MA 02154, telex 951793.

Concord Data Systems
Leading the Communications Revolution

WHAT'S BEHIND OUR CONVERSATIONAL TERMINAL MAKES WHAT'S IN FRONT OF IT MORE PRODUCTIVE.

At Teletype Corporation, we just made another intelligent move. We added an integrated modem to the 5410 conversational terminal—making it an even better value.

In addition to saving desk space and being cost-effective, the modem gives the 5410 "built-in" intelligence that greatly improves operator productivity. For example, all the operator has to do is push a single

key, and the modem will dial a host computer and perform the logon operation. And the operator can store up to three phone numbers and logon strings in the modem. Automatic answering is another feature of the modem, which is 212A compatible.

The 5410 is also now available with a white, green or amber Phosphor.

No matter which

color you choose, your operators will appreciate the crisp, easy-to-read characters. High resolution is maintained even when switching from an 80 to 132 column mode.

Other features that enhance productivity include 8 programmable function keys with matching screen labels; an English option menu; a detachable keyboard that tilts from 5 to 12 degrees and has tactile feedback; standard character sets; and the list goes on and on.

In the interest of operator productivity, write to Teletype Corporation for more information on the 5410 at: 5555 Touhy Ave., Dept. 3223-H, Skokie, IL 60077. Or call 1800 323-1229, ext. 111.

TELETYPE VALUE SETS US APART.

"Teletype" is a registered trademark and service mark of Teletype Corporation.



AT&T

Teletype Corporation

COMMUNICATIONS

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from over a full-duplex link at up to 0.6K bit/sec using the X.25 Level II protocol.

Prices for the three-channel Sumner start at \$1,595, and the eight-channel unit at \$3,195. A 9.6K bit/sec modem is \$4,995.

Datagram, 11 Main St., E. Greenwich, R.I. 08818.

LOCAL-AREA NETWORKS

Network Systems Corp. has announced that its Hyperbus local-area network product line can now be installed with the standard IBM Cabling System.

A spokesman said the Hyperbus supports both IBM 3270 devices and RS-232C devices. All Hyperbus units delivered since 1983 can function with the new cabling.

With Hyperbus, terminals and workstations are connected in a work area with twisted-pair wire to bus interface units, which are in turn interconnected with a central cable.

Hyperbus prices start at \$392.50 per port; no special features or options are required to interface with the IBM Cabling System.

Network Systems, 7800 Burns Ave. N., Minneapolis, Minn. 55436.

Concord Data Systems, Inc. has announced a new Hyperbus Network Analyzer, a first-level protocol logic analyzer for its IBM 3270-compatible Hyperbus/Net local network.

Hyperbus/Net consists of a 5M bit/sec frequency agile radio frequency modem, access unit and control unit. A network manager controls the network with a Digital Equipment Corp. VT100 or compatible terminal. The product is said to enable network managers to monitor and analyze network performance in real time.

The analyzer features a Command mode from which network managers

can select four options: monitor mode to survey the operation of the token-passing protocol in real time on any broadband channel; trace mode, which records specific network events through user-defined instructions; analysis mode, which displays a chronological record of frames monitored during a trace mode or of lengthy nonframe activities; and the summary option, which allows a user to read frame information stored during trace mode in a Token/Scope card memory queue. Help screens are available for each option.

Token/Scope Network Analyzer costs \$50,000.

Concord Data Systems, 300 Bow Hill Road, Waltham, Mass. 02154.

NETWORK SERVICES

AT&T Information Systems recently announced an Access Controller to serve as an interface between the company's Dataphone II, Level 4 System Controller and its Dataphone multiplexers.

A spokesman said the new product can be used to monitor and control all Dataphone multiplexers. These devices are controlled by System Controller workstations that connect transparently to any part of the Access Controller. The workstation issues commands and receives reports on the status of individual multiplexers and the network as a whole.

Polled commands can be grouped and stored in the Access Controller for immediate execution at a specific time or repeatedly at chosen intervals. Each multiplexer attached to the Access Controller can be addressed with English commands. The Access Controller can monitor from 16 to 240 ports.

The product, scheduled to be available in May, costs \$4,065 to \$26,200, depending on configuration.

AT&T Information Systems, 100 Southgate Plaza, Morrisville, N.J. 07960.

AT&T

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time, the line will drop."

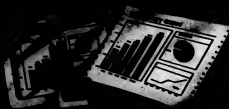
AT&T Communications intends to support DMI in a customer premise-to-network configuration by 1986, Ferguson announced. This would enable customers with DMI-equipped machines to access an AT&T Communications central office switch through Access T1.5 facilities, and from there, access on a channel basis any of AT&T Communications' family of digital services. Each of the 23 64K bit/sec channels, for example, could be routed through the company's Dataphone Digital Service to different locations.

To provide this capability, AT&T Communications will have to upgrade its switching facilities to recog-

nize the DMI signaling format, Ferguson said. "To bring Access service into our network and then branch it out into other services, we have to provide signaling to those other services," he said. DMI will be supported with Access T1.5 as an option.

Support of the DMI bit-oriented signaling format in this application — customer premise-to-network termination — is "a major step in AT&T Communications' plan to support an Integrated Services Digital Network," Ferguson concluded.

Copies of the technical reference addenda to AT&T Communications' FUD 41400, which details the DMI signaling format, are available for \$61, prepaid, from Literary Data Center, Inc., P.O. Box C-8104, Brooklyn, N.Y. 11201.



PERSONNEL



"We don't have a regular pension plan. We find it's cheaper in the long run just to let everyone embrace it like."

COMMUNICATIONS

CANADA See page 83

Bell Canada is also looking to expand fiber optics into its other services. "Right now we are studying the question of using fiber optics on our long-haul networks," said David Burr, director of planning and standards for Bell Canada's corporate engineering group. "We are also looking seriously at fiber optics for use in the local loop, particularly to serve large office buildings whose tenants could take advantage of fiber optics' high-volume, high-bandwidth capability."

This is only the beginning. According to Euromarketing Intelligence, a research firm in Newbury, R.I., the worldwide market for fiber optics reached \$761 million last year. Various forecasts indicated that the worldwide market will range between \$3 and \$6 billion by the end of the decade. And—even those numbers may be low. In the U.S. alone, for example, a dozen companies have budgeted \$6 billion to be spent over the next four years on long-distance telephone networks.

Projects of similar magnitude are also under way in other parts of the world, especially in Europe and Japan, and a number of international fiber-optic links are also in the works. Add to that fiber optics' potential in other fields, such as local-area networks, and the growth potential for the market is anybody's guess.

This rapid spread of fiber-optic technology is not surprising when the advantages of the media are compared to conventional technologies. Fiber is extremely accurate, with error rates as low as one error per billion bits. It boasts commercially available transmission speeds in the range of 500M bit/sec, and in labora-

tory tests that level has been exceeded several times. Because the signal consists of pulses of light, fiber optics is also immune to electrical interference and offers a high level of security.

Further gains are being made as new types of fiber-optic cable are developed. The current trend is toward monomode fiber-optic cable vs. more traditional multimode cables. As their names suggest, the two cables differ in the number of paths they allow a light beam to travel along. Monomode, which permits only one possible beam route, is gaining favor in long-distance networks largely because of potential cost savings. A signal requires less frequent amplification when it only has one path to follow, meaning a monomode network needs fewer signal repeaters along its route. These repeaters represent a major portion of network costs.

99
Bell Canada has installed more than 20,000 km of fiber-optic cable in its phone net and plans to double that by the end of 1985.

If fiber optics still has disadvantages, the most pressing of these occurs when it comes to interfacing with conventional communications systems. A recent report by International Data Corp. (IDC), a Framingham, Mass.-based research firm, pointed out that optical fiber-optic signals must still be converted back to electrical form for amplification.

In addition, the report said, fiber-optic technology still lacks a simple, low-cost method for multiplexing fiber-optic signals. The IDC report predicted that fiber optics will soon surpass microwaves in long-haul networks due to its potentially greater carrying capacity.

Even satellite systems will feel the squeeze. IDC said that international telecommunications services are currently split at 40% undersea cable and 60% satellite. By 1990, the report said, the ratio will be 66% undersea to only 35% satellite.

But even these advantages are not enough to let buzzwords let them jump their product, correctly or incorrectly, into one class of equipment. By itself, XYZ Corp.'s 123MDW means little. But when 123MDW becomes an intelligent voice/data private branch exchange, the product gains a measure of credibility, even if it does not work or does not provide the functions offered by other voice/data PBXs.

Communications managers should not let buzzwords influence purchase decisions because they can mask immature technologies. At Interface, Chow paraphrased John Gantz, editor of the "Tech Street Journal" investment newsletter. "Five years after the trade press and consultants stop talking about a technology, it will actually be implemented," Chow said. Five years may be a conservative estimate. Despite years of talk about local-area networks, they remain an elite technology.

Even the most optimistic research firm predictions estimate that only 16% of all micros will be interconnected with local nets by 1986. By then, talk about local-area networks may have begun to give way to actual implementation of the technology.

Only by experiencing the implementation of new technologies will managers begin to understand their practical considerations.

PROBLEM See page 83

diates and a local-area network. Thank-you very much," said Wushow Chen, professor of computer science at North Carolina State University in Raleigh, N.C. "What you are left with is a bunch of buzzwords."

A manager cannot solve problems with buzzwords. And move often than not, the buzzwords do nothing but confuse the issues at hand.

Buzzwords usually connote technologies that may not be widely used today but are expected to be commonplace in the future. Consultants and researchers are fond of buzzwords because buzzwords lend credence to bold predictions. It doesn't matter if the predictions are never realized. In fact, buzzword technologies often never gain widespread acceptance.

Buzzwords can make people sound knowledgeable. A consultant's knowledge, for example, may be limited to theories concerning technical trends rather than encompassing the practical considerations of implementation. That's why consultants often have difficulty answering questions like those posed at the panel session.

Vendors also like buzzwords.



Test Your Microcomputer IQ*

1. Name a totally integrated software package that was rated #1 by *Software Digest*. _____
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3. Who will educate IC personnel or end-users at their site or yours? _____
4. What provides virtually any type of PC communications capability—from simple TTY to 3278/79 emulation? _____
5. What provides a micro software facility that allows you to customize a system to your specific requirements? _____
6. Who are the premier micro consultants to the *Fortune* 1350 companies? _____
7. Who has made the word hot-line obsolete, by staffing a full-service support center with computer professionals? _____
8. What is the easiest way for an IC manager to satisfy the many end-user needs in the organization? _____
9. What company's evolutionary approach to software and service (also demonstrated by NOMAD, now NOMAD2, the premier 4GL/DBMS) ensures that they'll be a major force in the micro marketplace for years to come? _____
10. Name the companies that can provide all of the above? _____

*(Turn Page Upside Down for Answers)

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SYSTEMS & PERIPHERALS

DEC trims memory tab

MAYNARD, Mass. — Digital Equipment Corp. has reduced the add-on memory prices for large-volume buyers of its VAX, PDP-11 Ultrabits and Q-bus systems using 54K-bit memory chips. The company said it has implemented volume purchase prices for its add-on Ultrabits memory.

The revised prices apply only to quantities of 200 or more in any combination of eligible products and is therefore geared primarily to OEMs.

If an OEM already has a volume agreement in effect, that customer can purchase several add-on memory options in small increments throughout the year, according to DEC.

The VAX memory boards for the VAX-11/750, 11/730, 11/760 and 11/780 systems have been dropped from approxi-

mately \$2,750 per megabyte to \$1,850 per megabyte.

Volume purchase prices for add-on Ultrabits memory have been reduced from approximately \$4,800 per megabyte to \$3,000 per megabyte.

Subsided Q-bus memory prices have been reduced and include the MBV11 (1M byte) Q-bus that was previously \$2,800 and is now \$1,500, and the MBV11 LP (128K bytes) that was reduced from \$1,000 to \$450. All of the prices above apply to minimum quantity orders of 200.

No further reductions apply on these items. Similar end-user price cuts have been made for the Q-bus and Ultrabits, the vendor said.

More information can be obtained from DEC, Maynard, Mass. 01754.

Large WP users get laser printer

CUPERTINO, Calif. — Motorola/Four Phase Systems, Inc. has announced its Model 8156 laser printer as an option to its Series 4000 and 5000 families of office information systems. The printer is geared to users with large word processing requirements, the vendor said.

The 8156 — priced at \$39,500 — is a xerographic printer that features 300- by 300-dot resolution and 12 pages/min output. Standard features include two 96-char. utility fonts for vertical and horizontal printing and an operator self-test and diagnostic display.

Options include a variety of fonts, a leasing plan for 36 or 48 months and several service programs.

More information is available from Motorola/Four Phase at 10700 N. De Anza Blvd., Cupertino, Calif. 95014.

Datamedia ups 1620 support

NASHUA, N.H. — Datamedia Corp. has announced that its Model 1620 supermicrocomputer is now able to support up to 43 users.

Replacement of the Pick Systems Pick operating system from Version 1.3 to Version 2.0 — along with the 2M-byte memory board the company announced in January and the Model 1620's 2K-byte memory cache — allows the system to support up to 43 users, the vendor said.

Datamedia said that it will provide Version 2.0 of the operating system free of charge to the company's existing customers.

A 2M-byte 43-user Model 1620 Supermicro configured with the Pick operating system costs \$36,400.

More information is available from Datamedia, 401 Amherst St., Nashua, N.H. 03063.



MINISTAR
Karl Marx Building
New York, N.Y.

Altos 3068 carving niche

With the introduction of the newest member of its multi-user microcomputer family — the Altos 3068, a 30-user system built around Motorola, Inc.'s 68020 microprocessor — Altos Computer Systems, Inc. appears to be trying to establish itself on the upper tier of an emerging class of computer systems based on microprocessors. The Altos 3068, however, is capable of a performance that rivals large minicomputers.

Although many supermicrocomputer vendors have set their sights on the traditional minicomputer marketplace, Altos, one of the first companies to use the 68020, appears to have managed to scrape its way to the top of the heap, at least temporarily.

Jim Renaldi, a senior analyst at Dataquest, Inc., a San Jose, Calif.-based market research firm, said, after evaluating a preview model of the system, that he accepts Altos' contention that the Altos 3068 can match the performance of a Digital Equipment Corp. VAX-11/780. The Altos 3068, he said, gains much of its performance capability from its architecture, which is based on a state-of-the-art microcomputer with a proprietary bus structure.

Scheduled for shipment this summer, the Altos 3068 will probably strengthen the company's position in the multiuser microcomputer market, Renaldi said.

"Altos has really brought to market a

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■ Raster Technologies and Boston's Computer Museum are sponsoring a contest for graphics artists/76

■ Accret Information Systems unveiled a turnkey document storage and retrieval and storage system/76

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Report targets systems capacity

DP execs urged to adopt work load forecasting program

WASHINGTON, D.C. — Systems capacity forecasting is playing an increasingly important role in the life-cycle management of data processing systems and should become an ongoing process in most shops.

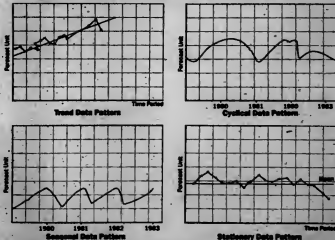
This is the finding of recent report issued by the National Bureau of Standards called "Guide on Work Load Forecasting." The report contends that DP managers should start a capacity forecasting program with an analysis of historical data and collection of future requirements.

Several steps can aid DP executives in performing effective work load forecasting. These include the following:

- Identifying the forecasting objectives.
- Organizing a forecasting team.
- Collecting data by work load levels.
- Analyzing historical data.
- It is necessary to assess systems work load on different levels. For example, a work load can be

See FORECAST page 76

THE FOUR MOST COMMON TYPES OF SYSTEM USE



SOURCE: NATIONAL BUREAU OF STANDARDS

SYSTEMS & PERIPHERALS

Computer museum, graphics firm to sponsor contest

NORTH BILLERICA, Mass. — Raster Technologies, Inc. and Boston's Computer Museum are jointly sponsoring a contest for developers of computer-generated graphics images.

Called the First Annual International Computer Graphics Image Contest, the competition is offering a \$2,000 grand prize for the most creative, unique and visually appealing graphics image entered. Awards of \$1,000, \$500 and \$200 will also be offered for runners-up, according to Raster Technologies.

Entries should be submitted in a 35mm color slide format; two slides per entry must be included. Submissions must be received by Raster Tech-

nologies by May 30, and all entries must contain identifying information that will allow the judges to determine the source of the entry. Winners will be announced July 25 at the Raster Technologies booth at Siggraph '85 in San Francisco. The winning entries will be displayed at the Computer Museum after Aug. 1, Raster Technologies said.

Professional, student categories

There are two entry categories for professionals (those currently employed and working on a computer graphics system) and a student category (for those currently enrolled full-time at an accredited college or university), the company said.

Entries will be judged by a panel of computer graphics designers including Allen Barr, associate professor of computer science at the California Institute of Technology; Alvy Kaye, a computer graphics consultant; Oliver Strimling, associate director and curator of the Computer Museum; and Andrian van Dam, chairman and professor of the computer science department at Brown University in Providence, R.I.

For more information, or to submit entries, contact the First Annual International Computer Graphics Image Contest, c/o Raster Technologies, Nine Executive Park Drive, North Billerica, Mass. 01862.

TURKEY SYSTEMS

San Antonio Information Systems (AIS) has released a turnkey document storage and retrieval system that incorporates an IBM Personal Computer, AIS Find search and retrieval software and a micrographics reader/printer.

Find was written to provide modular growth from a single personal computer-based system to large-scale turnkey document image management systems controlling a combination of micrographics and optical disk media. Prices start at \$35,000.

AIS, Suite 600, 131 Stewart Street, San Francisco, Calif. 94105.

DATA STORAGE

Motorola/Four Phase Systems, Inc. has introduced a 3000-byte hard disk drive that doubles the maximum disk storage for the company's Series 6000 and Series 5000 office information systems.

The DD050 is a rack-mounted drive with 1768 bytes of formatted storage capacity. Up to four drives may be used for a capacity of 1,104M bytes. A Four Phase NP/80 intelligent disk controller is required to add the drive to the 4000 or 5000.

The price of the DD050 disk is \$32,000 with volume discounts available. The required NP/80 disk controller costs \$10,700.

Motorola/Four Phase Systems, 10700 N. De Anza Blvd., Cupertino, Calif. 95014.

American Digital Corp. has announced two disk drives for the

firm's System 78-1 minicomputer. A Data Products, Inc. Cipher group code recording Carchetype 14-in. tape drive provides up to 180M bytes of storage per reel to back up large Winchester disk drives.

Also available is Fujitsu America, Inc.'s Eagle 1004-in. Winchester-type fixed disk drive with 474M-byte capacity and 18-msec positioning time. As an update to the System 78-1, the price of the Cipher group code recording Carchetype is \$4,900. The Fujitsu drive costs \$6,800.

American Digital, 3535 W. Peterson, Chicago, Ill. 60658.

Inteco, Inc. has introduced its Model M2T-3 magnetic tape coupler that interfaces built-in formatted tape drives with Telex Instruments, Inc. D5000 and D5000 minicomputers.

The M2T-3 supports data transfer rates of up to 1M bytes/sec and uses electronically erasable programmable read-only memory technology to replace on-board switches. The M2T-3 reportedly supports up to four tape drives, including any mix of start/stop, streaming, cache, group coded recording and tri-density.

The M2T-3 Tape Coupler consists of a coupler, one set of tape cables, diagnostic software, a streaming utility and complete documentation and costs \$1,675.

Inteco, 6850 Shady Oak Road, Eden Prairie, Minn. 55544.

TERMINALS

ITT Courier Terminal Systems has introduced its ITT 1778, an IBM 3270-compatible display terminal

that attaches directly to IBM 3274 and 3278 controllers.

The 1778 has a 12-in. monitor, green or amber screens and a choice of three keyboards — a 92-key data entry format, a typewriter format and a typewriter format with numeric keypad. It costs \$1,550 for the green monitor with keyboard and \$1,600 for the amber monitor with keyboard.

ITT Courier Terminal Systems, 1515 W. 14th St., Tempe, Ariz. 85281.

Innovative Electronics, Inc. has announced its Transactor terminal at bar code data-entry terminal which works with the firm's Rastermaster central control unit and Phactory Data Collection system.

Information gathered by the Transactor terminal can be on-line to

the host computer, or stored in the Transactor for later use and report generation. The user may download files to the Transactor from the host for validation purposes.

The terminal is connected to the Transactor via RS-422 multi-dropped communications. It is equipped with a 16-char. alphanumeric display and a bar code wand. A laser scanner is optional.

Transactor costs \$1,350, the vendor said.

Innovative Electronics, 4714 N.W. 160th St., Miami, Fla. 33041.

Leo Data Corp. has unveiled its Model 2130 color display unit which is compatible with IBM's 3270 display.

The Model 2130 includes a 14-in.
Continued on page 72

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File Monitor Pinpoints problem files/volumes and shows effects of loading. Aids VSAM file definition. Analyzes I/O contention. <ul style="list-style-type: none"> • Each CICS I/O measured • CICS events captured • Provides VSAM split data • Causes better balance and performance 	Application Interface Identifies and tracks specific applications and events. Supports LU6.2, MVS/TSO, GENCLINK, MVS/BAF, and DB2. User interfaces, clocks and counters. Resource Controls Prevents system outages by automatically controlling applications that exceed CPU, file, I/O or storage limits.	Supertace Gauges effect of new applications on system, reduces loading times, allows production tracing and enhances performance. <ul style="list-style-type: none"> • Quick application trace • Resource consumption data • Application debugging tool • Alternative to ALR TRACE in production system

SYSTEMS & PERIPHERALS

continued from page 70
monitor, 125-key keyboard and logic module. It operates in either on-line or local-command modes. In on-line mode, the display will support host applications requiring up to seven colors. In the local-command mode, users may select two- or four-color support.

The unit costs \$2,046 and will be available this month.
Lee Data, 7075 Flying Cloud Drive, Minneapolis, Minn. 55344.

Electronics Ltd. has introduced two special-purpose color data display modules that were designed for desktop computers, public information display systems, stock exchange display and educational applications.

The ECD 1904 is a 19-in. unit with 3.6mm dot pitch and 80-char., 640-pixel by 240-line resolution. The ECD 2504 is a 25-in. unit with 3.6mm dot pitch and an 80-char., 640-pixel by 40-line resolution.

The monitors are compatible with the IBM Personal Computer and with U.S. and European red-green-blue

standards, the vendor said.

The U.S. prices for the units are approximately \$605 for the 1904 and \$1,150 for the 2504. They will be available in late April.

Electronics, 205 Wellington St. N., Etobicoke, Ont., Canada N9G 4J6.

Chromatix, Inc. has announced six peripherals for its CX 1500 Colorgraphic Display System: a digitizer, a mouse, a light pen, a trackball, a function switchbox and beam switchbox.

The X-T Digitizer is a 15-in. by 10.5-in. tablet with an 11.7-mq. active flat white matte surface. It has a four-color coded button patch that can select and position objects on the screen or trace a menu, the vendor said. The digitizer costs \$2,895.

A nonmechanical, optical mouse includes three buttons for input selection and a 9-in. by 11-in. mouse-pad surface. It is supported by firmware supplied in the CX 1500 Workstation and in all Graphical Kernel System (GKS) host library options. One mouse costs \$585.

The CX Light Pen is said to allow user input of screen co-

ordinates by pointing the pen at an illuminated area of the screen. It can be used as a logical input device in GKS programs, the vendor said. The light pen costs \$645.

The trackball reportedly allows user input of positioning information for user feedback. It features three momentary action switches with red LEDs, quadrature outputs, a peripheral processor and cast-aluminum housing, the vendor said. The trackball generates 200 ball-revolution/min at 192 pulses/revolution. It costs \$2,595.

A 34-function switchbox has snap-fit programmable switches that allow input of frequently used user-defined character strings with a single keystroke. The vendor said. GKS support reportedly allows use of this feature as a logical input device in GKS programs. The switchbox, including a snap-in overlay, costs \$2,595.

Beam switches are said to allow choice of a user-defined menu or input frequently used, user-defined character strings with a single keystroke. GKS support reportedly allows the switch to be used as a logical input device in GKS programs. The switch consists of an eight-function switch printed-circuit board, beam modifications and mounting panel. One switch costs \$595.

Chromatix, 2555 Mountain Industrial Blvd., Tucker, Ga. 30084.

Televideo Systems, Inc. has unveiled its Model 955 Aseli VDT, which was designed for office automation applications.

The terminal features a 14-in., 80- by 132-col. display. It has up to four pages of memory in both 80- and 132-col. mode.

The 955 terminal costs \$699 and is scheduled to be available for shipment this month.

Televideo Systems, 550 E. Brokaw Road, San Jose, Calif. 95112.

Loar Slinger, Inc. has unwrapped its ADM 13 Fine editing terminal, which is compatible with its ADM 5, ADM 13 and ADM 21 terminals and the Televideo Systems, Inc. 955, 956, 913 and 936 terminals.

The ADM 13 Fine features an 80- or 132-col. display, programmable cursor keys, a variable format display memory, variable-speed vertical scrolling and horizontal scrolling. It provides two pages of 80- or 132-col. by 34-line display memory or a choice of wide and long page memory configurations.

A four-page memory option is available to double the standard memory formats and add a 158-col. by 48-line display memory format. The terminal includes 16 pro-

grammable function keys.

The ADM 13 Fine costs \$745.
Loar Slinger, 501 E. Bell Road, Anaheim, Calif. 92805.

PRINTERS/
PLOTTERS

Datasearch Computer Corp. has released its TXX220 Multitextual multi-mode printer for the IBM System/34, 36 and 38.

The TXX220 is said to emulate the IBM 5055, 5054 and 5050 printer series and interface directly to the IBM systems via a standard twin-axial cable in its back panel. It

does not require an external protocol conversion box, the vendor said.

The printer can be used as an intermediate or terminating printer on a chain of up to seven devices. It also has a Centronics Data Computer Corp.-compatible parallel interface for use as a shared printer on an Aseli system, according to the vendor.

Features include 230 char./sec. printing in draft mode, 50 char./sec. in normal mode and 40 char./sec. in near-letter-quality mode, as well as dot-addressable graphics.

The TXX220 costs \$2,495.
Datasearch Computer, 4218 Stuart Andrew Blvd., Charlotte, N.C. 28210.

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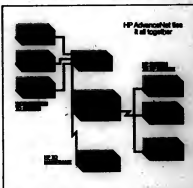
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SYSTEMS & PERIPHERALS

FORECAST from page 68

classified by its mission, its functions, quantifiable events, DP operations, DP resource usage and DP plans. Each of these work load levels can be associated with different levels of management and/or users. Evaluation of the DP operation at the various levels will provide the necessary input for translating mission requirements into DP resource needs, the report said.

After work load data has been collected from the different levels, the forecaster must analyze the data with regard to applications systems and total work load, the report said.

The analysis of historical data by applications systems can reveal important information necessary to build a model that will be used to forecast a given applications system.

For example, historical data from different levels can be plotted using simple histograms and scatter diagrams.

Choosing a technique

Upon completion of the preliminary steps to forecasting, DP executives should select a forecasting technique. The most commonly used techniques include the following:

- Simple moving average.
- Exponential smoothing.
- Classical decomposition.
- Simple linear regression.
- Multiple linear regression.
- The Bar-Jakob method — considering data availability and the pattern of the historical data, accuracy vs. cost of using the technique and desired forecast span, the report said.

Forecast spans should be broken down into short-, medium- and long-

range time horizons for which forecasting is to be performed. The short range is from one week to two years; the medium range is from two to five years; and the long range is defined as a time horizon of five or more years, according to the report.

With the exception of the Bar-Jakob forecasting technique, all other techniques assume that one of four underlying patterns can be identified in the historical data. These general trends are as follows:

- The trend data pattern, where the work load increases as a result of changes in the way the existing system is used. This includes, for example, an increase in the number of transactions processed by the system or in program development.
- A cyclical data pattern that can be caused by a system change, such as the introduction of new applica-

tions or the elimination of others.

■ A seasonal data processing pattern caused by periodic tasks that affect the overall systems work load.

■ An irregular data pattern that occurs when a time series behaves as random fluctuations around a mean value, and no trend can be identified.

Analyzing results

The forecaster should build a model of using part of the historical data and then simulate the model on the remaining data to show how the forecast values compare with the actual values, the report said.

The results of the forecasting process need to be analyzed carefully and evaluated before any decisions can be made based on the data. The results present decision makers with information on whether adequate computer resources are available to perform the user's work load.

The "Guide on Work Load Forecasting of the Computer Science and Technology" series (O/N 000-000-0000-4), which gives examples of forecasting using the various models and includes a suggested reading list, can be obtained for \$5 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20540.

ALLOS from page 69

system that will set a lot of the industry on its ear," he predicted.

Tim Rajerin, vice-president of microcomputer research at Creative Strategies, Inc., a market research firm also based in San Jose, agreed with Bumside. Allos is "way ahead of everybody else" with the release of the Allos 2000, Rajerin said, noting that the system's modular design of four boxes is a flexibility that few other companies can match. "The system has tremendous potential," he said.

In the Allos 2000, up to eight specially designed boards can be inserted into the chassis, with each board serving a distinct function. In a standard configuration, a system would include a CPU board, a random-access memory board, two file processor subsystem boards and a serial communications board.

"It can plug-in boards the way a personal computer does," Rajerin said. "That really sets them apart." He agreed with Bumside that the Allos 2000 strengthens the company's stand in the midsize microcomputer market. Allos has already established itself as a company that offers quality and service with its current family of midsize systems, based on Intel Corp. microprocessors, Rajerin said. Now, he noted, it will be able to offer its customers an upgrade path to a system based on a true 32-bit microprocessor.

Rajerin also applauded Allos' selection of AT&T's Unix System V operating system, noting that System V is on its way to becoming the standard in the Unix market.

Both analysts praised the Allos 2000's remote diagnostics software, which is available as an option on the system. "Most midsize microcomputer companies don't have remote diagnostics," Bumside noted. "That's much more typical in the minicomputer or mainframe market."

Neither analyst thought Allos would encounter problems getting an adequate supply of the Motorola microprocessors for the system.



COMPUTER INDUSTRY

Wang girds for offensive

Planning product bows despite downturn

By Peter Dettlrich
CI Staff

ROSLYN — Wang Laboratories, Inc. believes the industry-wide slowdown in orders growth could last up to a year, but despite that, the company intends to pursue selective product announcements over the next few months, senior executives said recently.

Wang recently projected 10% growth for the third quarter ended March 31 and a decline in profits for the fourth quarter and fiscal year that ends June 30; the company also confirmed it plans a two-week production shutdown in July (CW, March 26). It was also reported that top executives had agreed to a 10% pay cut.

Claiming that Wang's problems are symptomatic of an industry-wide slowdown, John Cunningham, president and chief executive officer of the office automation leader, said, "I don't think it's a three-month phenomenon, but I also don't

think it's a five-year phenomenon." He said the slowdown, which other vendors have acknowledged, could extend for nine to 12 months.

Speaking here at a press briefing, Cunningham and other Wang executives conceded that delays in shipping Wang Office Automation products contributed to the drastic downturn in Wang's earnings from its historic 30% growth rate. "I think if we had done a better internal job, we could be feeling less cut so much," Cunningham said.

He added that Wang will attack the general slowdown as an internal problem and will make "its operations more efficient." During the current fiscal year that ends in June, he said, Wang will have hired only about 1,000 employees, down from the original goal of hiring 4,000.

Wang executive vice-president and chief development officer, said the delay in shipping Wang Office resulted from the complexity and scope of the project. "The magnitude of the project just continued to grow," Wang said. "The architecture was the right one, but there was just a

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Datapoint to hinge sale on users' needs

By Peter Dettlrich
CI Staff

SAN ANTONIO — With the battle for management control decided, Datapoint Corp. will move toward liquidation in a manner designed to ensure that its "customers are provided with the best of products and services," officials said recently.

A week after the company negotiated a conditional surrender with arbitrator Arthur B. Edelman (CW, March 26), the top executives of the company mailed out a letter to customers pledging that the liquidation effort will be "designed to satisfy our customers and strengthen our products and services." The letter was signed by Edelman, who was named chairman as part of the settlement, and Edward F. Gistaro, the company president and former chief operating officer who assumed the title of chief executive officer from resigned Chairman Harold E. O'Kelly.

In an interview with Computerworld, Gistaro stated that Datapoint will not sell off its various operating divisions in a piecemeal manner. What has been holding up the sale of its manufacturing and service operations, he said, is that "we haven't been able yet to put together an ongoing business relationship between the potential buyers."

Edelman and the company have said they hope to sell off the service operations for \$200 million and the manufacturing operations, which produce distributed data processing and office automation equipment and networks, for \$100 million.

Gistaro said he met with Edelman and was convinced the arbitrator is committed to meeting the best interests of the customers and recognizes the value of the company's relationships with customers. "That's the only reason I'm with the company," Gistaro said, adding that he anticipates

See W0800 page 84

IPL blames 1984 revenue losses on shipping delays, market lag

WALTHAM, Mass. — IPL Systems, Inc. recently reported a net loss of \$11.9 million, or \$1.56 per share, on revenue of \$4.5 million for fiscal 1984, which ended in December.

In 1983, the midrange plug-compatible miniframe vendor posted a loss of \$4.2 million, or 85 cents per share, on revenue of \$9.9 million.

In the fourth quarter of 1984, IPL experienced a net loss of \$5.1 million, or \$1.03 per share, on revenue of \$1.9 million. A year earlier, the company had reported a

loss of \$2.5 million, or 51 cents per share, on revenue of \$2.3 million.

According to IPL, the 1984 results were adversely affected by several factors, including depressed prices in the midrange miniframe computer market, delays in the shipment of its IPL Model 4460 and the provision of significant reserves against inventories.

The company said that cost-cutting measures implemented during the year enabled it to increase its cash balance to \$2.9 million in the fourth quarter.

Press conference gaffe raises questions of credibility



INDUSTRY INSIGHT
Peter Dettlrich
CI Staff Writer

On a recent Tuesday, Wang Laboratories, Inc. held what seemed to be a comprehensive press briefing to go over the company's business and product strategy. The reason for the briefing, top executives said, was that Wang felt it needed to do a better job communicating with the press.

The following day, Wang confirmed that just the previous week it had told production employees to take vacations or unpaid leaves during the first two weeks of July for a company-wide production shutdown (see related story above). Asked why no mention of the shutdown was made during the press briefing, a Wang spokesman laconically replied that the company considered the is-

ssue "an employee communication." Substituted for your consideration (note: the same phrase from The Night Zone) is a classic example of a credibility gap in the making.

Several months ago during a non-employee-related meeting in Boston, according to one person who was there, Wang President John Cunningham was discussing the company's phenomenal 30% growth rate, which had not yet declined to the 10% rate the firm expects to record for the quarter that ended in March. Noting that most of Wang's competitors had at one time or another suffered setbacks in business goals, Cunningham reportedly told the audience, "I feel like the last virgin."

That phrase points out what some industry analysts believe is a potentially disastrous disconnect on Wang's ledger books: The company has never before had to deal with adversity.

Right now, the company is in the

thorns of adversity; a Boston newspaper even reported that a senior management man at Wang is evaluating a number of cost-cutting measures, including layoffs.

During the press briefing, Cunningham noted that there is little Wang can do to counter the extremely negative impact of the strong dollar in international currency markets. The challenge, he said, is how the company manages its business during this difficult period.

Right now, crisis management is the key issue for Wang. The company is at a turning point in its history. No longer able or content to live off its famed word processing boom, it can only prosper by moving ahead with new technological solutions to defend its office automation base during the invasion of the Big Blue sales horde.

Wang has taken an aggressive stance. A current print advertising campaign has unashamedly taken

potshots at IBM, and the advertising effort has moved to television in spots aimed at areas with high-priced, high-impact facilities directed against the moral integrity of IBM.

Although that campaign is applauded in this corner for its directness and mass appeal, advertising alone is not sufficient to move the company forward. The sympathy bought with millions of advertising dollars can vanish overnight in the light of negative news stories. The fact is that Wang has a lot more to learn than most of its competitors during the current industry downturn. Above all, it needs to establish credibility by taking a proactive stance during an adverse period.

By neglecting to mention a scheduled production shutdown, Wang has indicated that, at this point, it is attempting to bar the doors against bad news. That can produce a shelter mentality, something that breeds nasty surprises.

COMPUTER INDUSTRY

Investors seek to scoop up shares of Wall Street darlings



COVER LINE
Stephen Lipson

Institutional investors are constantly on the prowl for undiscovered high-technology companies whose stock prices will appreciate to reflect their rapid growth in revenues and earnings.

When institutions collectively acquire 30%, 50% or more of the outstanding shares of such companies, these become the darlings of Wall Street. Their prices may appreciate rapidly as even more institutions rush in to get a piece of the action.

By the same token, when the stock of these companies falls out of favor, institutions eliminate these positions from their portfolios, which results in dramatic price drops of these shares.

During the last two years, 21st Century Research has been keeping track of changes in institutional ownership of approximately 200 stocks of some of the fastest growing and most popular high-technology companies. An analysis of these changes during the 12-month period from January 1984 to January 1985 yields some fascinating results indicating which stocks are on their way to becoming the new darlings of the institutions and which ones are definitely falling out of favor.

For example, Valid Logic Systems, Inc., supplier of computer-aided engineering systems for custom design of complex microchips, went public in October 1983, and by February 1984, Standard & Poor's Corp. reported that 0.11% of its stock was acquired by institutions. A month later, 6% of that stock was owned by institutions, and by January 1985, almost 21% ended up in institutional portfolios. Institutions increased their ownership of Valid Logic at an average monthly rate of 1.86%.

On the other hand, Tandem Corp., the minicomputer leader long standing as an institutional darling with more than 50% of its outstanding shares in

institutional portfolios, reported that it had been dumped consistently by institutions last year at a rate of 2.6% every month. It also reported that by January 1985, only 40% was left in institutional portfolios.

IBM is the bellwether of high-technology stock, and more than 50% of its stock is in the portfolios of more than 1,600 institutions at all times. IBM has the most widely held stock ever, but IBM is a poor indicator of the high-technology movements of institutional investors. Although institutions are always trading IBM, its institutional ownership level remains relatively stable. Actually, institutions held much larger percentages of shares of companies like Digital Equipment Corp. (DEC), Texas Instruments, Inc. (TI) or Tandem Computers, Inc. (TCS) but in considerably fewer portfolios. As a result, prices of these stocks are volatile.

Observe acquisition rates

To single out the high-technology darlings in the making, it is necessary to observe institutional ownership acquisition rates as soon as the company goes public. Based on our list in *Investment Technology*, the manufacturer of electrically erasable programmable read-only memory semiconductors, Seeg Technology's institutional ownership rose from a mere 0.78% in February 1984 to 27% by the beginning of 1985, which translates into an average monthly acquisition rate of about 54%.

Stratus Computer, Inc., the fall-safe computing start-up, recently caught the attention of IBM. Stratus is also among the institutional rising stars when monthly accumulation rates averaged 36% in 1984 with 12% of its outstanding shares in professional portfolios.

Tandem, the established leader in the fall-safe computing business, has as far witnessed the challenges and its institutional ownership edged from 62% in January 1984 to almost 70% one year later. However, this does not yet reflect the effect on the tie-up between these two firms.

Compaq Computer Corp. and Kaypro Corp. are two of the recent portable computer "pure plays" that illustrate how institutions did not go for the concept, despite extensive publicity and spectacular growth of both companies. As soon as Compaq went public, 14 institutions grabbed more than 5% of its stock. Two months later in May 1984, Kaypro held a paltry 0.56% of the company, which is far from qualifying it to become a Wall Street darling.

Kaypro, by comparison, was a nonstarter with institutions that acquired 0.46% of the stock by May 1984. At the outset of 1985, Kaypro held a paltry 0.56% of the company, which is far from qualifying it to become a Wall Street darling.

Synopsis is president of 21st Century Research of North Bergen, N.J., and publisher of Supergrowth Technology USA.

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For more information, contact Ed Marecki, National Sales Director, *Computerworld Focus*, 375 Cochituate Rd., Framingham, MA 01701. Or call (617) 879-0700.

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COMPUTER INDUSTRY

Kodak to buy electronic imaging firm

ROCHESTER, N.Y. — Eastman Kodak Co. recently announced plans for its second acquisition in recent weeks with an agreement to pay \$44.3 million for all outstanding shares of Elkanix Corp., an electronic imaging company located in Bedford, Mass.

Earlier, Kodak had announced an agreement to acquire Verbatim Corp., the Sandyvale, Calif.-based manufacturer of floppy disks and other storage products.

Meanwhile, Kodak's rival in the instant photographic market, Polaroid Corp. of Cambridge, Mass., announced recently it had signed an agreement to buy the U.S. operations of Verbatim's Data Encore diskette duplication services.

The Data Encore operation, not included in the Kodak acquisition of Verbatim, provides software duplication and copy protection devices.

Polaroid, which, like Kodak, is seeking to expand into the computer products field, also announced in March that it had increased its ownership in Advanced Color

Technology, Inc. (ACT) from 38% to 82%. Polaroid acquired its initial investment in ACT, a designer and manufacturer of color ink-jet printers, in October 1983.

Kodak said it had agreed to purchase in excess of 50% of Bikonix's stock from several officers and directors and certain shareholders for \$16.12 a share. It will also seek the remaining shares for the same price.

Kodak produces such merchandise as digital cameras, laser beam recorders, scanners and image processing systems and in 1984 posted revenues of more than \$4.5 billion. The company will be operated as a wholly owned subsidiary of Kodak following completion of the agreement, Kodak said.

J. Phillip Sauter, Kodak executive vice-president and general manager of the company's Photographic and Information Management Division, said the acquisition "provides an important element in our long-term business strategy for both our Graphics Imaging Systems Division and our Alex subsidiary."

PE elects McDonnell board chairman

NORWALK, Conn. — Perkin-Elmer Corp. recently elected President and Chief Executive Officer Horace G. McDonnell as chairman of the board. Executive Vice-President of Operations Gaylor N. Kelley was named president and chief operating officer, and McDonnell will continue as CEO.

McDonnell succeeded Robert H. Surmans, who had served as chairman since 1989. Surmans will remain on the board of directors until the company's annual meeting in November.

McDonnell served as president and chief operating officer of PE from 1960 until 1964, when he was elected CEO.

Since joining the firm in 1963, he has served as executive vice-president of operations, senior vice-president and vice-president and general manager of the Instrument group. He is also a director of Uniroyal, Inc.

Bell Atlantic to acquire computer chain

DALLAS — Compushop, Inc., a 65-store computer retailing chain in the West and Midwest, recently announced it will be acquired by Bell Atlantic, the Bell system's Philadelphia-based holding company for the mid-Atlantic states.

Bell Atlantic also recently acquired Sorbus, Inc., a nationwide computer maintenance firm, and Tri-continental Leasing Corp., an equipment leasing and financing company. In addition, Bell Atlantic holds a majority interest in A Deeper Co., which markets electronic paging equipment and cellular telephones.

Under terms of the acquisition, one share of Bell Atlantic common stock will be exchanged for 14 shares of CompuShare common stock, of which there are approximately 3.5 million shares outstanding. Bell Atlantic will also hold the option to purchase all remaining unissued CompuShare stock.

Bell Atlantic reported sales of \$973 million, or \$6.94 per share, in fiscal 1984 and recently increased its annual dividend to \$5.00 per share.

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COMPUTER INDUSTRY

IBM exec named

SAN JOSE, Calif. — IBM recently announced the appointment of Ray S. Abelsky to the position of the General Products Division vice president.

Abelsky, formerly assistant to the group executive of the former Information Systems and Technology Group, replaces John E. Burman, who was named group executive of the new Information Systems Technology Group (ITG) March 18.

The General Products Division is responsible for worldwide development and U.S. manufacturing of storage systems and program products.

Abelsky was general manager of the San Jose facility from 1983 to 1984 and was appointed a division vice-president in 1983.

DATAPOINT

Don page 77

poter remaining on board after a sale is negotiated.

Edelman's strategy has been to maximize the return to shareholders by selling off portions of stock for more than the market value of the company as a whole. His similarly wrestled control of Management Assistance, Inc. and liquidated that company and was named vice-chairman of Mohawk Data Sciences Corp. with a similar goal.

Despite Edelman's strategy, Glatsare said, customers will benefit because the components of the company will be placed "in very strong hands."

The battle between Edelman and the Datapoint board, which was replaced in the settlement to give Edelman 50% voting control on the

board, had a negative impact on customers and sales personnel, Glatsare said. This, in addition to an industry-wide downturn, has reduced sales over the past few months, he said.

However, Glatsare said, the fact that a settlement was reached amicably "will have a salutary effect" on sales and customer relations.

A further part of the settlement was that Edelman will be reimbursed for expenses incurred in his takeover effort. Glatsare said reimbursement can be no more than \$1.5 million.

The company still faces a shareholder lawsuit challenging retention bonuses, or "golden parachutes," established by the board when O'Kelley was in charge. Approximately \$16 million was placed in trust for 36 top officers. Glatsare said funds were placed in trust for "various reasons, not just retention bonuses."

WANG

Don page 77

larger amount of standard-based code that has to be written for the product than we had expected."

According to Wang, the son of the company's founder and chairman, Alan Wang said much of the Wang Office system could not be tested until the entire system was up and running.

Capturing the market

Much of the briefing focused around how Wang intends to capture the emerging market for what it calls "integrated information processing" in the office environment.

Company executives stressed that Wang is positioning itself to be the major alternative to the office environment to IBM and is taking a systems approach to processing word, image, data and text in the integrated office.

The difference between Wang and other vendors, the executives said, is that Wang perceives the network itself as the center of corporatewide processing, rather than a host processor.

Total solutions provider

Samuel F. Gagliano, vice-president of product planning and product strategy, said the company intends to be a total solutions provider for small businesses and provide Fortune 1,500 companies with departmental data processing and office automation systems that will tie into IBM-based corporate MIS.

Gagliano said Wang's VS series of processors will form the basic office engine for word and data processing, looking downward to word processors and microcomputers and looking upward to centralized processing systems.

In a month or so, Gagliano said, Wang will announce a desktop system that will include Wang's 2300 small business system architecture on a chip, using very large-scale integration to package what formerly required 11 circuit boards.

Also, Gagliano added, sometime in the next few months, Wang will introduce a multiuser type of micro-computer system.

"The next step is to place the VS system on a desktop," Gagliano added.

Aggressive ad campaign launched

In the meantime, the company has mounted an aggressive advertising campaign aimed at shoving home to IBM's aggressive strategy to sell departmental systems based on its System/36.

The campaign, belittling the System/36 and IBM in general, "is very new, is getting [Wang] aggressive again," according to Robert L. Dorset, senior vice-president of U.S. operations, sales and marketing strategy.

Cunningham expressed some restraint at IBM for announcing products and statements of intent that reach far into the future. However, he stressed about saying IBM is intentionally seeking to disrupt competitor's marketing plans.

"I don't think IBM understands the disruption in the marketplace caused by statements of direction and some long-term product announcements," he said.

Cunningham added, "It is very difficult for any player to compete against some of the more nebulous [IBM] direction statements."

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This position is responsible for providing SCADA with an effective and stable operating computer environment through system level software generation, installation, and maintenance. Assures the reliable operation of the SCADA applications systems by monitoring the system performance and recommending and making changes to improve the system. This position will also have application system maintenance responsibilities. Requires five years experience in systems programming including system level software on Data General's ACS/VS operating system. SCADA applications experience is preferred. A degree in computer science or engineering is preferred but additional experience may be substituted for education.

SENIOR SUPERVISORY CONTROL ANALYST

This position will be responsible for the maintenance, design, development, and implementation of supervisory control, metering and other oil movements and measurement computer applications systems. This position requires five years SCADA computer programming and design experience using both Fortran and Assembly languages. Candidates with experience on Data General ACS/VS Operating Systems will be given preference. A degree in Computer Science or Engineering is preferred but additional experience may be substituted for education.

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RANDOLPH MIPS OF THE MONTH

APRIL 1985

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SYSTEMS	MIPS	REMARKS	SYSTEMS	MIPS	REMARKS
Performance Per Month	Performance Per Month		Performance Per Month	Performance Per Month	
4321	6.25	1	4321-3	6.5	1
4321-1	0.25	1 to 1	26852	4.2	
4321-11	0.35	1 to 1	26853	4.2	
4321-2	0.50	1 to 4	26854	4.4	
4321-3	0.50	1 to 4	26855	4.4	
4321-4	0.50	1 to 4	26856	4.4	
4321-5	0.50	1 to 4	26857	4.4	
4321-6	0.75	2 to 6	26858	4.4	
4321-7	0.75	2 to 6	26859	4.4	
4321-8	0.75	2 to 6	26860	4.4	
4321-9	0.75	2 to 6	26861	4.4	
4321-10	0.75	2 to 6	26862	4.4	
4321-11	1.1	2 to 6	26863	4.4	
4321-12	1.1	2 to 6	26864	4.4	
4321-13	1.1	2 to 6	26865	4.4	
4321-14	1.1	2 to 6	26866	4.4	
4321-15	1.1	2 to 6	26867	4.4	
4321-16	1.1	2 to 6	26868	4.4	
4321-17	1.1	2 to 6	26869	4.4	
4321-18	1.1	2 to 6	26870	4.4	
4321-19	1.1	2 to 6	26871	4.4	
4321-20	1.1	2 to 6	26872	4.4	
4321-21	1.1	2 to 6	26873	4.4	
4321-22	1.1	2 to 6	26874	4.4	
4321-23	1.1	2 to 6	26875	4.4	
4321-24	1.1	2 to 6	26876	4.4	
4321-25	1.1	2 to 6	26877	4.4	
4321-26	1.1	2 to 6	26878	4.4	
4321-27	1.1	2 to 6	26879	4.4	
4321-28	1.1	2 to 6	26880	4.4	
4321-29	1.1	2 to 6	26881	4.4	
4321-30	1.1	2 to 6	26882	4.4	
4321-31	1.1	2 to 6	26883	4.4	
4321-32	1.1	2 to 6	26884	4.4	
4321-33	1.1	2 to 6	26885	4.4	
4321-34	1.1	2 to 6	26886	4.4	
4321-35	1.1	2 to 6	26887	4.4	
4321-36	1.1	2 to 6	26888	4.4	
4321-37	1.1	2 to 6	26889	4.4	
4321-38	1.1	2 to 6	26890	4.4	
4321-39	1.1	2 to 6	26891	4.4	
4321-40	1.1	2 to 6	26892	4.4	
4321-41	1.1	2 to 6	26893	4.4	
4321-42	1.1	2 to 6	26894	4.4	
4321-43	1.1	2 to 6	26895	4.4	
4321-44	1.1	2 to 6	26896	4.4	
4321-45	1.1	2 to 6	26897	4.4	
4321-46	1.1	2 to 6	26898	4.4	
4321-47	1.1	2 to 6	26899	4.4	
4321-48	1.1	2 to 6	26900	4.4	
4321-49	1.1	2 to 6	26901	4.4	
4321-50	1.1	2 to 6	26902	4.4	
4321-51	1.1	2 to 6	26903	4.4	
4321-52	1.1	2 to 6	26904	4.4	
4321-53	1.1	2 to 6	26905	4.4	
4321-54	1.1	2 to 6	26906	4.4	
4321-55	1.1	2 to 6	26907	4.4	
4321-56	1.1	2 to 6	26908	4.4	
4321-57	1.1	2 to 6	26909	4.4	
4321-58	1.1	2 to 6	26910	4.4	
4321-59	1.1	2 to 6	26911	4.4	
4321-60	1.1	2 to 6	26912	4.4	
4321-61	1.1	2 to 6	26913	4.4	
4321-62	1.1	2 to 6	26914	4.4	
4321-63	1.1	2 to 6	26915	4.4	
4321-64	1.1	2 to 6	26916	4.4	
4321-65	1.1	2 to 6	26917	4.4	
4321-66	1.1	2 to 6	26918	4.4	
4321-67	1.1	2 to 6	26919	4.4	
4321-68	1.1	2 to 6	26920	4.4	
4321-69	1.1	2 to 6	26921	4.4	
4321-70	1.1	2 to 6	26922	4.4	
4321-71	1.1	2 to 6	26923	4.4	
4321-72	1.1	2 to 6	26924	4.4	
4321-73	1.1	2 to 6	26925	4.4	
4321-74	1.1	2 to 6	26926	4.4	
4321-75	1.1	2 to 6	26927	4.4	
4321-76	1.1	2 to 6	26928	4.4	
4321-77	1.1	2 to 6	26929	4.4	
4321-78	1.1	2 to 6	26930	4.4	
4321-79	1.1	2 to 6	26931	4.4	
4321-80	1.1	2 to 6	26932	4.4	
4321-81	1.1	2 to 6	26933	4.4	
4321-82	1.1	2 to 6	26934	4.4	
4321-83	1.1	2 to 6	26935	4.4	
4321-84	1.1	2 to 6	26936	4.4	
4321-85	1.1	2 to 6	26937	4.4	
4321-86	1.1	2 to 6	26938	4.4	
4321-87	1.1	2 to 6	26939	4.4	
4321-88	1.1	2 to 6	26940	4.4	
4321-89	1.1	2 to 6	26941	4.4	
4321-90	1.1	2 to 6	26942	4.4	
4321-91	1.1	2 to 6	26943	4.4	
4321-92	1.1	2 to 6	26944	4.4	
4321-93	1.1	2 to 6	26945	4.4	
4321-94	1.1	2 to 6	26946	4.4	
4321-95	1.1	2 to 6	26947	4.4	
4321-96	1.1	2 to 6	26948	4.4	
4321-97	1.1	2 to 6	26949	4.4	
4321-98	1.1	2 to 6	26950	4.4	
4321-99	1.1	2 to 6	26951	4.4	
4321-100	1.1	2 to 6	26952	4.4	

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				SYSTEMS		
4700	6.25	1	8 to 32	AS-0003	8.5	8 to 32
4700-1	0.25	1 to 1	8 to 32	AS-0004	8.5	8 to 32
4700-2	0.35	1 to 4	16 to 32	AS-0005	7.2	8 to 64
4700-3	0.50	1 to 4	8 to 64	AS-0006	6.4	8 to 64
4700-4	0.50	1 to 4	8 to 64	AS-0007	6.4	8 to 64
4700-5	0.50	1 to 4	8 to 64	AS-0008	11.2	16 to 64
4700-6	0.75	2 to 6	16 to 64	AS-0010	16.0	16 to 64
4700-7	0.75	2 to 6	16 to 64	AS-0011	16.0	16 to 64
4700-8	0.75	2 to 6	16 to 64	AS-0012	16.0	16 to 64
4700-9	0.75	2 to 6	16 to 64	AS-0013	16.0	16 to 64
4700-10	0.75	2 to 6	16 to 64	AS-0014	16.0	16 to 64
4700-11	0.75	2 to 6	16 to 64	AS-0015	16.0	16 to 64
4700-12	0.75	2 to 6	16 to 64	AS-0016	16.0	16 to 64
4700-13	0.75	2 to 6	16 to 64	AS-0017	16.0	16 to 64
4700-14	0.75	2 to 6	16 to 64	AS-0018	16.0	16 to 64
4700-15	0.75	2 to 6	16 to 64	AS-0019	16.0	16 to 64
4700-16	0.75	2 to 6	16 to 64	AS-0020	16.0	16 to 64
4700-17	0.75	2 to 6	16 to 64	AS-0021	16.0	16 to 64
4700-18	0.75	2 to 6	16 to 64	AS-0022	16.0	16 to 64
4700-19	0.75	2 to 6	16 to 64	AS-0023	16.0	16 to 64
4700-20	0.75	2 to 6	16 to 64	AS-0024	16.0	16 to 64
4700-21	0.75	2 to 6	16 to 64	AS-0025	16.0	16 to 64
4700-22	0.75	2 to 6	16 to 64	AS-0026	16.0	16 to 64
4700-23	0.75	2 to 6	16 to 64	AS-0027	16.0	16 to 64
4700-24	0.75	2 to 6	16 to 64	AS-0028	16.0	16 to 64
4700-25	0.75	2 to 6	16 to 64	AS-0029	16.0	16 to 64
4700-26	0.75	2 to 6	16 to 64	AS-0030	16.0	16 to 64
4700-27	0.75	2 to 6	16 to 64	AS-0031	16.0	16 to 64
4700-28	0.75	2 to 6	16 to 64	AS-0032	16.0	16 to 64
4700-29	0.75	2 to 6	16 to 64	AS-0033	16.0	16 to 64
4700-30	0.75	2 to 6	16 to 64	AS-0034	16.0	16 to 64
4700-31	0.75	2 to 6	16 to 64	AS-0035	16.0	16 to 64
4700-32	0.75	2 to 6	16 to 64	AS-0036	16.0	16 to 64
4700-33	0.75	2 to 6	16 to 64	AS-0037	16.0	16 to 64
4700-34	0.75	2 to 6	16 to 64	AS-0038	16.0	16 to 64
4700-35	0.75	2 to 6	16 to 64	AS-0039	16.0	16 to 64
4700-36	0.75	2 to 6	16 to 64	AS-0040	16.0	16 to 64
4700-37	0.75	2 to 6	16 to 64	AS-0041	16.0	16 to 64
4700-38	0.75	2 to 6	16 to 64	AS-0042	16.0	16 to 64
4700-39	0.75	2 to 6	16 to 64	AS-0043	16.0	16 to 64
4700-40	0.75	2 to 6	16 to 64	AS-0044	16.0	16 to 64
4700-41	0.75	2 to 6	16 to 64	AS-0045	16.0	16 to 64
4700-42	0.75	2 to 6	16 to 64	AS-0046	16.0	16 to 64
4700-43	0.75	2 to 6	16 to 64	AS-0047	16.0	16 to 64
4700-44	0.75	2 to 6	16 to 64	AS-0048	16.0	16 to 64
4700-45	0.75	2 to 6	16 to 64	AS-0049	16.0	16 to 64
4700-46	0.75	2 to 6	16 to 64	AS-0050	16.0	16 to 64
4700-47	0.75	2 to 6	16 to 64	AS-0051	16.0	16 to 64
4700-48	0.75	2 to 6	16 to 64	AS-0052	16.0	16 to 64
4700-49	0.75	2 to 6	16 to 64	AS-0053	16.0	16 to 64
4700-50	0.75	2 to 6	16 to 64	AS-0054	16.0	16 to 64
4700-51	0.75	2 to 6	16 to 64	AS-0055	16.0	16 to 64
4700-52	0.75	2 to 6	16 to 64	AS-0056	16.0	16 to 64
4700-53	0.75	2 to 6	16 to 64	AS-0057	16.0	16 to 64
4700-54	0.75	2 to 6	16 to 64	AS-0058	16.0	16 to 64
4700-55	0.75	2 to 6	16 to 64	AS-0059	16.0	16 to 64
4700-56	0.75	2 to 6	16 to 64	AS-0060	16.0	16 to 64
4700-57	0.75	2 to 6	16 to 64	AS-0061	16.0	16 to 64
4700-58	0.75	2 to 6	16 to 64	AS-0062	16.0	16 to 64
4700-59	0.75	2 to 6	16 to 64	AS-0063	16.0	16 to 64
4700-60	0.75	2 to 6	16 to 64	AS-0064	16.0	16 to 64
4700-61	0.75	2 to 6	16 to 64	AS-0065	16.0	16 to 64
4700-62	0.75	2 to 6	16 to 64	AS-0066	16.0	16 to 64
4700-63	0.75	2 to 6	16 to 64	AS-0067	16.0	16 to 64
4700-64	0.75	2 to 6	16 to 64	AS-0068	16.0	16 to 64
4700-65	0.75	2 to 6	16 to 64	AS-0069	16.0	16 to 64
4700-66	0.75	2 to 6	16 to 64	AS-0070	16.0	16 to 64
4700-67	0.75	2 to 6	16 to 64	AS-0071	16.0	16 to 64
4700-68	0.75	2 to 6	16 to 64	AS-0072	16.0	16 to 64
4700-69	0.75	2 to 6	16 to 64	AS-0073	16.0	16 to 64
4700-70	0.75	2 to 6	16 to 64	AS-0074	16.0	16 to 64
4700-71	0.75	2 to 6	16 to 64	AS-0075	16.0	16 to 64
4700-72	0.75	2 to 6	16 to 64	AS-0076	16.0	16 to 64
4700-73	0.75	2 to 6	16 to 64	AS-0077	16.0	16 to 64
4700-74	0.75	2 to 6	16 to 64	AS-0078	16.0	16 to 64
4700-75	0.75	2 to 6	16 to 64	AS-0079	16.0	16 to 64
4700-76	0.75	2 to 6	16 to 64	AS-0080	16.0	16 to 64
4700-77	0.75	2 to 6	16 to 64	AS-0081	16.0	16 to 64
4700-78	0.75	2 to 6	16 to 64	AS-0082	16.0	16 to 64
4700-79	0.75	2 to 6	16 to 64	AS-0083	16.0	16 to 64
4700-80	0.75	2 to 6	16 to 64	AS-0084	16.0	16 to 64
4700-81	0.75	2 to 6	16 to 64	AS-0085	16.0	16 to 64
4700-82	0.75	2 to 6	16 to 64	AS-0086	16.0	16 to 64
4700-83	0.75	2 to 6	16 to 64	AS-0087	16.0	16 to 64
4700-84	0.75	2 to 6	16 to 64	AS-0088	16.0	16 to 64
4700-85	0.75	2 to 6	16 to 64	AS-0089	16.0	16 to 64
4700-86	0.75	2 to 6	16 to 64	AS-0090	16.0	16 to 64
4700-87	0.75	2 to 6	16 to 64	AS-0091	16.0	16 to 64
4700-88	0.75	2 to 6	16 to 64	AS-0092	16.0	16 to 64
4700-89	0.75	2 to 6	16 to 64	AS-0093	16.0	16 to 64
4700-90	0.75	2 to 6	16 to 64	AS-0094	16.0	16 to 64
4700-91	0.75	2 to 6	16 to 64	AS-0095	16.0	16 to 64
4700-92	0.75	2 to 6	16 to 64	AS-0096	16.0	16 to 64
4700-93	0.75	2 to 6	16 to 64	AS-0097	16.0	16 to 64
4700-94	0.75	2 to 6	16 to 64	AS-0098	16.0	16 to 64
4700-95	0.75	2 to 6	16 to 64	AS-0099	16.0	16 to 64
4700-96	0.75	2 to 6	16 to 64	AS-0100	16.0	16 to 64
4700-97	0.75	2 to 6	16 to 64	AS-0101	16.0	16 to 64
4700-98	0.75	2 to 6	16 to 64	AS-0102	16.0	16 to 64
4700-99	0.75	2 to 6	16 to 64	AS-0103	16.0	16 to 64
4700-100	0.75	2 to 6	16 to 64	AS-0104	16.0	16 to 64
4700-101	0.75	2 to 6	16 to 64	AS-0105	16.0	16 to 64
4700-102	0.75	2 to 6	16 to 64	AS-0106	16.0	16 to 64
4700-103	0.75	2 to 6	16 to 64	AS-0107	16.0	16 to 64
4700-104	0.75	2 to 6	16 to 64	AS-0108	16.0	16 to 64
4700-105	0.75	2 to 6	16 to 64	AS-0109	16.0	16 to 64
4700-106	0.75	2 to 6	16 to 64	AS-0110	16.0	16 to 64
4700-107	0.75	2 to 6	16 to 64	AS-0111	16.0	16 to 64
4700-108	0.75	2 to 6	16 to 64	AS-0112	16.0	16 to 64
4700-109	0.75	2 to 6	16 to 64	AS-0113	16.0	16 to 64
4700-110	0.75	2 to 6	16 to 64	AS-0114	16.0	16 to 64
4700-111	0.75	2 to 6	16 to 64	AS-0115	16.0	16 to 64
4700-112	0.75	2 to 6	16 to 64	AS-0116	16.0	16 to 64
4700-113	0.75	2 to 6	16 to 64	AS-0117	16.0	16 to 64
4700-114	0.75	2 to 6	16 to 64	AS-0118	16.0	16 to 64
4700-115	0.75	2 to 6	16 to 64	AS-0119	16.0	16 to 64
4700-116	0.75	2 to 6	16 to 64	AS-0120	16.0	16 to 64
4700-117	0.75	2 to 6	16 to 64	AS-0121	16.0	16 to 64
4700-118	0.75	2 to 6	16 to 64	AS-0122	16.0	16 to 64
4700-119	0.75	2 to 6	16 to 64	AS-0123	16.0	16 to 64
4700-120	0.75	2 to 6	16 to 64	AS-0124	16.0	16 to 64
4700-121	0.75	2 to 6	16 to 64	AS-0125	16.0	16 to 64
4700-122	0.75	2 to 6	16 to 64	AS-0126	16.0	16 to 64
4700-123	0.75	2 to 6	16 to 64	AS-0127	16.0	16 to 64
4700-124	0.75	2 to 6	16 to 64	AS-0128	16.0	16 to 64
4700-125	0.75	2 to 6	16 to 64	AS-0129	16.0	16 to 64
4700-126	0.75	2 to 6	16 to 64	AS-0130	16.0	16 to 64
4700-127	0.75	2 to 6	16 to 64	AS-0131	16.0	16 to 64
4700-128	0.75	2 to 6	16 to 64	AS-0132	16.0	16 to 64
4700-129	0.75	2 to 6	16 to 64	AS-0133	16.0	16 to 64
4700-130	0.75	2 to 6	16 to 64	AS-0134	16.0	16 to 64
4700-131	0.75	2 to 6	16 to 64	AS-0135	16.0	16 to 64
4700-132	0.75	2 to 6	16 to 64	AS-0136	16.0	16 to 64
4700-133	0.75	2 to 6	16 to 64	AS-0137	16.0	16 to 64
4700-134	0.75	2 to 6	16 to 64	AS-0138	16.0	16 to 64
4700-135	0.75	2 to 6	16 to 64	AS-0139	16.0	16 to 64
4700-136	0.75	2 to 6	16 to 64	AS-0140	16.0	16 to 64
4700-137	0.75	2 to 6	16 to 64	AS-0141	16.0	16 to 64
4700-138	0.75	2 to 6	16 to 64	AS-0142	16.0	16 to 64
4700-139	0.75	2 to 6	16 to 64	AS-0143	16.0	16 to 64
4700-140	0.75	2 to 6	16 to 64	AS-0144	16.0	16 to 64
4700-141	0.75	2 to 6	16 to 64	AS-0145	16.0	16 to 64
4700-142	0.75	2 to 6	16 to 64	AS-0146	16.0	16 to 64
4700-143	0.75	2 to 6	16 to 64	AS-0147	16.0	16 to 64
4700-144	0.75	2 to 6	16 to 64	AS-0148	16.0	16 to 64
4700-145	0.75	2 to 6	16 to 64	AS-0149	16.0	16 to 64
4700-146	0.75	2 to 6	16 to 64	AS-0150	16.0	16 to 64
4700-147	0.75	2 to 6	16 to 64	AS-0151	16.0	16 to 64
4700-148	0.75	2 to 6	16 to 64	AS-0152	16.0	16 to 64
4700-149	0.75	2 to 6	16 to 64	AS-0153	16.0	16 to 64
4700-150	0.75	2 to 6	16 to 64	AS-0154	16.0	16 to 64
4700-151	0.75	2 to 6	16 to 64	AS-0155	16.0	16 to 64
4700-152	0.75	2 to 6	16 to 64	AS-0156	16.0	16 to 64
4700-153	0.75	2 to 6	16 to 64	AS-0157	16.0	16 to 64
4700-154	0.75	2 to 6	16 to 64	AS-0158	16.0	16 to 64
4700-155	0.75	2 to 6	16 to 64	AS-0159	16.0	16 to 64
4700-156	0.75	2 to 6	16 to 64	AS-0160	16.0	16 to 64
4700-157	0.75	2 to 6	16 to 64	AS-0161	16.0	16 to 64
4700-158	0.75	2 to 6	16 to 64	AS-0162	16.0	16 to 64
4700-159	0.75	2 to 6	16 to 64	AS-0163	16.0	16 to 64
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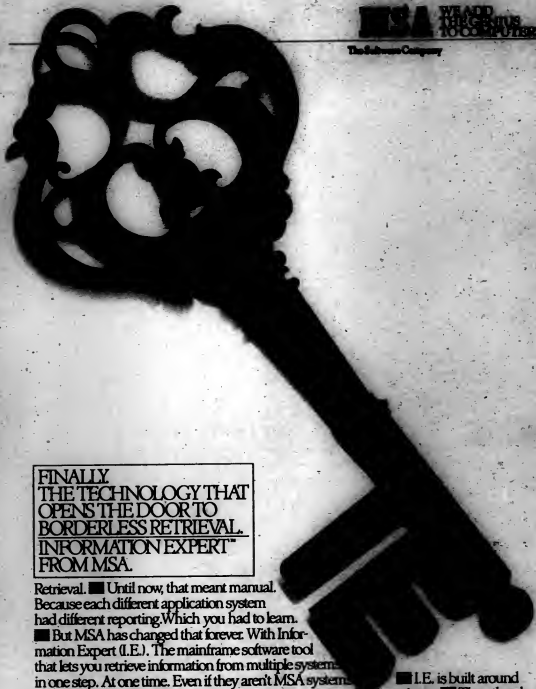
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